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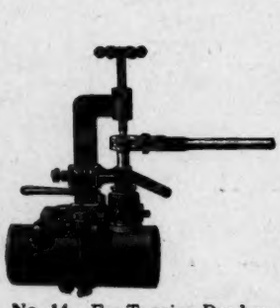

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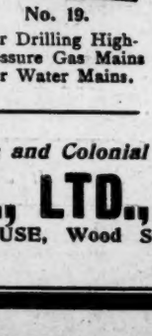

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EDITORIAL NOTES.

Gas-Works Practice in Benzol Recovery.

THE gas industry is settling-down to ascertain the details of the conditions under which the oil-washing of gas for the recovery of benzol can be most effectively carried on in view of its special circumstances as suppliers of gas which must retain a certain quality to make it an acceptable commodity, and one that shall give as little trouble as possible. In the main, there is the practice in the oil-washing of gas from coke-ovens to serve as a guide; but, in respect of details, this practice will not in every particular apply to gas-works operations, as the ultimate use and purpose of the gas are not alike. In the case of coke-oven gas, its destination, after being denuded of its light oils, is, generally speaking, for local heating purposes; and so not much attention is paid to its thermal constancy, nor does its naphthalene condition—owing to the fact that it has not to pass through a large distribution system—occasion much concern. The gas industry has therefore to put into the oil-washing process a (so to speak) greater refinement than is considered necessary in the case of the working at coke-oven plants; and in other respects, too, method has to conform to circumstances. In the matter of details, consideration has to be given not merely to the application of the process during the period of the war, when excuses may hold good for any shortcomings, but to the future, inasmuch as it is almost generally in contemplation that the process shall be continued henceforth as an integral part of the operations of a gas-works, in view of the country's requirements for motor spirit, dye materials, &c., and in view, too, of the fact that gas undertakings are plainly the legitimate fuel suppliers of the future. The information given by Dr. T. Gray, in his lecture to the Waverley Association of Gas Managers, shows that, of the importation of motor spirit in 1914, some 119 million gallons were consumed, and that, if all the gas produced during coke and gas making were oil-washed, there would be a probable yield of some 60 million gallons per annum of 90 per cent. benzol. These figures show that, taking into account the other uses of benzol, there should be no inadequacy of market outlets for all that can be produced—consistently with the obligations of the gas industry under the conditions of current gas use.

Reference to this calculation of Dr. Gray is found in the opening paragraph of an extremely thoughtful address which Mr. George T. Purves delivered at the meeting of the Western District of the Scottish Junior Gas Association last Saturday week, and which was printed in last Tuesday's "JOURNAL." The address, in our opinion, forms an important contribution at this juncture to the developing work that is proceeding in connection with many gas-works operations. The tar-washing process is set in its proper place. It is merely a temporary, and to an extent a crude, expedient, the use of which is not justified in the larger works longer than is necessary to enable the installation of an oil-washing plant, though in smaller works where carbonization is not, as a rule, carried on at such high temperatures, and probably where continuous vertical retorts are in use, it may continue to be applied. Its efficiency is relatively poor; the trouble with naphthalene since its introduction has also been pronounced. But with the oil-washing system as applied to gas-works, there are also certain difficulties that are more or less severe according to the scale of operations. But it is part of the duty of gas engineers and chemists to find ways and means of surmounting difficulties when they present themselves; and the ones to which Mr. Purves refers, as far as gas-works operation is concerned, are not—he himself shows—of an insuperable character.

For example, he points out that the capital charges on a benzol plant are a very substantial part of the total, and so for economic working the material factor is throughput. In view, however, of the varying summer and winter production on most gas-works, it will, he says, be quite impossible to keep the plant going at full capacity during the summer; and, this being so, he does not think that benzol recovery will be quite so favourable a proposition on gas as on coke works. The condition of variation between summer and winter is a common one in connection with practically all gas-works' operations. It does not exist to the same degree that it formerly did; but, whatever its extent, there is no section of the manufacturing plant that is kept in operation to the same degree in summer as in winter. In view of this, there will be nothing new to the gas engineer in finding that the same condition applies to the oil-washing plant—in fact, that is his natural anticipation. And we have yet to learn that, seeing that coke-oven working has to respond to the demand for metallurgical coke, the output of gas from coke-oven plant proceeds with decorous regularity. Incidentally, there is a good word of caution in Mr. Purves' remark that gas for town-supply purposes should be washed uniformly throughout the year. The same observations as to economy ruling best where plant is kept running at full capacity applies to the benzol-refining plant; but this is an easier matter for gas-works to negotiate. Mr. Purves has indicated how; and Mr. Thos. Glover, of Norwich, has, in the interests of the smaller gas undertakings, pointed to practically the same course two or three times this year. It is, under Mr. Glover's plan, by the oils being sent from a group of undertakings to the gas-works most conveniently situated for a refining plant, or, as Mr. Purves suggests, "by taking in crude light "oil from other works during the summer months." The former, for a number of works, is more likely to be the procedure; and refining plant would be required in only the one works. For this purpose, too, it is conceivable that motor tank-waggons would be employed for transport, so as to make the scheme as economical as possible. However, the two main difficulties in connection with oil-washing for benzol in gas-works are seen to be due to variable gas production; but, as we say, they are not insuperable.

There was also consideration by Mr. Purves of points in working. For example, as to whether it is preferable to use tower or rotary scrubbers for oil-washing on gas-works. For tar-washing, tower scrubbers have generally been found the better. With oil, however, it is necessary that the work should proceed as uniformly as possible, in order to produce consistency in the gas supply. Therefore with varying gas production, using tower scrubbers, it would be desirable to have a proportional volume of wash-oil to gas; but this could only be done to a limited extent without affecting scrubbing efficiency. For this reason, Mr. Purves is in favour of rotary scrubbers, by means of which the absorption surface can be maintained independent of the volume of the circulated wash-oil. Perhaps, however, the difficulty he suggests, as to the impairment of scrubbing efficiency with tower scrubbers in dealing with the variations of make, could be overcome by adopting the Norwich practice of admitting the oil in two stages—debenzolized oil being introduced at the top of the scrubber, while at a lower stage benzolized oil is recirculated. By this means, a higher saturation is obtained. The naphthalene difficulty is also dealt with by Mr. Purves; and this is one of the problems associated with the washing of gas for benzol extraction. The trouble has certainly not been less in some cases since oil-washing has been practised. One has to get to the cause to realize the method of avoidance. Mr. Purves supplies an explanation, which points to the advisability in gas-works of not attempting to produce too high a grade of light oil, but rather, by the provision of an efficient fractionating column on the crude still, to improve the grade of light oil by reducing the amount of wash-oil present with the light oil. The explanation is briefly that, in the production of the higher grades of light oil, naphthalene and some of the higher benzene homologues carried away in the vapour in the wash-oil still are thrown back into the wash-oil by partial dephlegmation. Thus the

naphthalene absorption power of the wash-oil is much diminished, while the benzene absorption power remains unaffected. So the ratio of naphthalene to condensable liquid hydrocarbons in the gas may be increased, with uncomfortable results in the distribution system. By avoiding such a degree of dephlegmation and (as suggested above) producing a lower grade of light oil, the wash-oil will be very largely stripped of naphthalene, and so a continued absorption of naphthalene from the gas can be effected with a probable reduction of the naphthalene difficulty. On the other hand, oil-washing has beneficial effect in reducing the carbon bisulphide and other organic sulphur compounds in the gas.

The point has often been discussed as to the position of the benzol scrubbers in a gas-works system; and it has been generally accepted that their situation should be after the ammonia scrubbing plant. For the sake of the oil-heating system, it is also preferable (though making no difference to the benzol extraction) that in gas-works practice the benzol plant should come after the purifiers; and sufficient reason is supplied for this when Mr. Purves mentions that he has heard of steel tubes in the oil-heating system being damaged by ammonia in a fortnight. Moreover, the placing of the benzol-extraction plant after the purifiers will ensure the purifying material being unaffected by oil-spray. Altogether, this examination by Mr. Purves of the question of the oil-washing of gas, from the point of view of gas undertakings, but in the light of coke-oven practice, is especially valuable at the present time.

A Refractory Materials Conference.

Had it not been for the war, in all likelihood there would not have been the extended conference that was held last Wednesday, under the auspices of the Faraday Society, on the subject of "Refractory Materials." The gas industry has been studying the matter for some few years, and so have one or two other industries; but the iron and steel industry (which is a considerable user) appears to have let things take much their own course—in other words, have left the production of the heat-resisting materials it required very much to the views of the makers, who have not the requisite experience of their actual use, and formerly worked largely on traditional lines, instead of invoking the aid of science. Negligently proceeding, there must have been an immense waste of money directly and indirectly in connection with the furnaces and other plant in which such materials are used in steel works. The President of the conference (Sir Robert Hadfield) admitted the vital importance of the subject to, and the neglect of it in, the iron and steel industry. The truth of this has been forcibly brought home to that industry by the demand for an accelerated output of steel for war purposes.

However, the outstanding features of the several hours' discussion were the testimony as to the disunited character of the work on refractory materials, and the real want of an intermingling of the knowledge of the scientist, the maker, and the user. It is probable that one result of the conference will be that a very strong effort will be made to bring about definite co-operation in, and co-ordination of, work. Seeing the importance of the subject, and the material value of the plants in which refractory materials are used, as well as of the work done in these plants, the efforts at improvement appear in contrast to have been puny, and not altogether worthy. This is not said in any derogatory vein of the work that has been accomplished, nor of the workers themselves. They have operated to the best of their ability in their individual circumstances. But the admissions made at the conference were—the conference itself in fact was—eloquent of insufficiency and of in some directions neglect. This should not be, and must not longer be. The country has gained an unenviable reputation for prodigality—a prodigality which led to importations of many kinds from other nations when our own country and Dominions across the seas possessed their own resources, to the neglect of those resources, and to parting with the control of certain of them to what are now enemy countries. We have an abundance of supplies of refractory materials at home and in various quarters of the Empire; the researches of the Geological Survey, the Imperial Institute, and Dr. Boswell testify to this. Therefore it is high time that the whole question of producing from our own stores of raw material the refractories which will render economical service, was taken in hand with thoroughness. Indeed, the production and use of heat-resisting materials have such a prominent part in our manufacturing industries that there is ample room for an Association—including scientific men, makers, and users—to take charge of the prosecution of investigation in every direction. It is an investigation in which there is money through the promotion of increased durability and service.

Carbonizing Data and Breeze Production.

In America, there has been large revival of coal-gas plant installation; and, in some of the structures, there have been embodied radical changes from old methods, as well as various minor points of novelty—all being directed to good gas production and works' economy and efficiency, which are the principal criteria by which a gas process must succeed or fall. Some particulars are in private possession as to gas makes in America (we do not know anything very definite as to the coal characteristics), which, after washing for benzol, have shown a calorific value of 550 B.Th.U., and a nitrogen content of a lowness which is rarely, if ever, seen in these days of high makes. This means that, although the gas is deprived of part of its illuminating constituents, consumers are getting a good combustible gas, and not a gas with a large percentage of inert gas mixed with the combustible components. In a report by the Carbonization Committee of the American Gas Institute, which is published elsewhere in this issue (together with some data extracted from tabular statements of considerable magnitude), there is incidental reference to certain new installations which embody these more or less radical changes; but no details are supplied as to their nature. Therefore, for the time being, there must be contentment with the vague hint as to developments in structural practices; and immediate interest must rest in the data published regarding the working of some of the more recent carbonizing installations. Even so, the figures lack full interest in view of the fact that there is no indication as to the specific type of plant, but only reference under the generic terms of horizontal (through and stop-end), inclined, vertical (continuous and intermittent), and coke-ovens.

The Committee decline to take any responsibility for the data. They are as supplied to them; and they are the returns showing what the various plants have done over a year, and not necessarily what they are capable of doing, and would do if tuned-up and operated for maximum result. In fact, the Committee do not appear to have any great faith in them from the comparative point of view, inasmuch as they are rather insistent in pointing out the frailties of the bases of such returns. We sympathize entirely with their criticism of the large dissimilarity of methods of determining operating figures which prevail in various undertakings; and this applies not only to the tests of the gas, but to the methods of weighing, or assessing the weight of, the coal and coke, and reporting liquid products and carbonizing labour. Standardization of methods of ascertaining results and of statement are very much needed. It is an old point with us; and years ago, after we had criticized the variety and capriciousness of methods of communicating in technical work carbonizing results and costs, Mr. W. R. Herring compiled and published a suggestive scheme. Nevertheless gas engineers largely continued their old individual courses of presenting their results; and there is still much disparity which vitiates comparison. The Committee now recommend that the American Institute should consider the matter of publishing a manual giving definite and detailed directions as to approved methods of weighing and sampling, analyzing, and measuring coal, coke, gases, and the other products of carbonization. Perhaps in this proposal a hint will be found for the enthusiastic members of our own Institution of Gas Engineers.

Turning to the tabulated data, a large amount of interest can be extracted from the few samples for the publication of which we have space. Take, for instance, the point as to breeze production. The breeze made with the stop-ended horizontal retorts is low—from 7·2 to 8·6 per cent., though there are two of the cases that compete in magnitude with the through retort production, which ranges from 10 up to 16·6 per cent. The inclined retorts are all bad—save one—in respect of breeze production. The exception shows a production of 6 per cent.; and in this instance a "D. B." conveyor and telpher are used. The others range between 15 and 16·5 per cent. The continuous verticals are, generally speaking, better than the through horizontals or the inclines; but there is one bad case (18 per cent.), and one fairly low example—9·7 per cent. All the others range from 10 up

to 15 per cent. In all these cases, the coke is discharged cold. With intermittent retorts, the percentage of breeze only ranges from 3 to 5·8; and, in these cases, "D.B." conveyors and sprays are used. This difference between the breeze makes points to two things—one that the coke is less dense from continuous than from intermittent retorts, and that the continual movement of the charge through the retorts (however correct from the scientific point of view in regard to producing a uniform quality of gas and improvement in other products) has some effect upon the yield of breeze in excess of the intermittent retorts, despite the fact that the coke from the latter is water-sprayed, while that from the former is discharged cold. There is nothing to be learned from the details given regarding the methods of coke quenching and carrying as to their effect on breeze production, seeing that there are approximately comparable maximum and minimum figures to be found relating to most of the quenching and carrying systems employed. From these American data, it would appear that the system of carbonization and the methods of retort operation have larger part in the production of breeze than have the modern systems of conveying.

Glancing over other particulars, it will be noticed that, generally speaking, there is not much to choose, under American working, between the different carbonizing systems in respect of the fuel accounts, and yet for the amount of work done there is a tremendous expenditure of thermal energy, which some of the improvements in the latest American retort-bench construction practice are directed to preserving from loss, and in part to utilization—for instance, in the production of steam. It is also noticeable from the tabulated information that in most cases the bulk of the coke is disposed of for domestic purposes; and, with two or three exceptions (excluding oven coke), the percentage sold for industrial use is small.

Junior Associations and their Men.

THE Junior Gas Associations are this session displaying considerable activity—more so than they in the aggregate have done the last session or two. Their ranks have been considerably drawn upon by the call of King and Country, and the time of the members by an enlargement of responsibilities in other directions. But for those who are continuing their customary work, there are many topics arising from the present situation upon which, with good result, there can be conference among them. The juniors are usually the ones upon whom responsibility falls for any particular lines of work; the chief engineer or general manager having sufficient to do just now with supervision and responsibility over the entire affairs of the undertaking. In the circumstances, the junior accumulates a considerable knowledge of a variety of technical processes and other matters that are of value to not only his own contemporaries, but to those of his chief. Experience also shows (and this is important) that among the juniors is to be found the precious characteristic of discretion in degree quite equal to anything found among the seniors. However, the junior organizations, *quâ* organizations, suffer from the constant "raids" that are made into their ranks for men to take office in higher spheres, which then make them competent for membership of the senior organizations. This condition necessitates constant recruiting. This is not a matter of great difficulty, seeing that the official ranks of the industry have to be frequently supplemented; for it is not an industry that stands still, and new work and fresh problems are now ever of its lot.

This fact renders it the more essential that the juniors of to-day, who will be the chiefs of to-morrow, should not spend all their time specializing in any one direction, to the neglect of other—maybe equally important—matters. Mr. G. C. Pearson, the Works Superintendent at the Windsor Street works, Birmingham, in the address that he recently delivered to the Midland Juniors, and which was published in major part last week, emphasized the point. This is, he said, an age of specialization; and the man possessing particular knowledge of a process will be the man required to direct that process. There is no doubt whatever that the tendency will become more and more marked for men specially trained in particular branches to become the controllers of the work in those branches. But it is vital that these men should attain a thorough grounding in, and general knowledge of, the industry, in order that they may realize the bearing that one phase may have upon another. This is a condition that is fundamental to specialization; for without basic and contributory knowledge the specialist necessarily depreciates his own value. The same contentions bear upon another point made by Mr. Pearson. It is as to the inclusion in Associations dealing with gas engineering of the trained technical men of gas contracting firms. This is a matter which was recently discussed in the "JOURNAL;" and we are pleased to see that the President of the Midland Juniors has the courage of his convictions, and announces that he and others hold the view that mutual benefit would arise by welcoming such trained men into their organizations. And why? Because they "lack that "scientific knowledge and gas-making experience necessary "for the production of finished coal gas; but they have "special knowledge of value to the Association in its stead." As we have argued, if these men could be brought into closer contact with the manufacturing work of the industry, they would be better equipped for serving it in their special lines. There is no gainsaying this contention; and it is the duty of gas men to see that they remove all ancient obstacles in every direction to any alteration that beneficially affects the interests of the industry. To carry out the views of Mr. Pearson and those of the Midland Junior Association who are of the like opinion, it will be necessary to alter one of the rules, which cannot be done until the end of the session. Meanwhile, it is for the members generally to consider the matter, so that an intelligent vote may be taken upon it whenever it is brought forward. We are persuaded as to the correctness of the views expressed, and should like to see similar views put into practice in other quarters.

Wear and Tear of Continuous Verticals.

An apprehension that has been hard to dispose of has reference to the wear and tear of continuous vertical retorts. It has been fancied that this would be of an inordinate character, and, combined with an initial cost heavier than for horizontal retorts would dissipate any anticipated advantages. The only satisfactory method of disposing of the apprehension is experience; and if there had only been attentive consideration to previous testimony, it would have been seen that experience gave to continuous verticals a good reputation in respect of this matter. However, cumulative experience from different sources is valuable; and we have now to add the testimony that Mr. G. C. Pearson advanced, in his Presidential Address to the Midland Juniors [*ante* p. 293] as to the structural stability in their vital parts of an installation of twenty-two beds of four Woodall-Duckham retorts that have been well worked at the Windsor Street (Birmingham) Gas-Works. They have been running some four years; and at the time the repairs were effected in one section last May, the installation had been in operation 1250 days, and close upon 21,000 tons had passed through each bed. There had been no patching or pointing, and no difficulties had developed in the working; and so there is every justification for Mr. Pearson's statement: "We have every reason to believe that the repairs will be a comparatively small item. Added to this we can show a considerable saving in maintenance and general charges; the cost of lighting, cleaning-up, waste, &c., being very much lower than for horizontal retorts." There has, however, been a falling-off in capacity. While the maximum throughput had reached 5·08 tons per retort per day, by the end of last year there was a decline to a little more than 4½ tons, owing to the roughness of the retorts causing delay in discharge, the lower carbonizing temperatures due to the wearing of the flues and the brickwork, and the widening of the retorts due to the wearing away through friction of the panel bricks, and probably to a small extent corrosive action. The upper parts of the retorts suffered considerably more depreciation than the lower parts. A table in the address shows that the verticals have proved a greater carbonizing power per man than even the coke-ovens—9·76 tons compared with 7·54 tons. With heavier charges for labour, the aid of mechanical operation and gravity in producing economy will probably be sought still more in the future; and therefore the factor of tons per man will be a strong consideration. Noted also will be the good experience with "Silco," which is not so refractory as some materials containing a higher percentage of silica, but gains in point of low expansion.

A Challenge for the "Multicooker."

Gas men throughout the country will be pleased to learn that the Executive Committee of the British Commercial Gas Associa-

tion have definitely challenged, through the Editor of "Truth," the "Multicooker" people to make good their claim, in a public test, as to a 75 per cent. saving, by using their appliances, of the gas consumed in and by ordinary gas-cookers, or to make forfeit, if they cannot substantiate it, of a useful sum in aid of such a good cause as the British Red Cross Society. Judging by their lavish advertising, the Company running this (according to their own appraisement) remarkably meritorious gas-saving appliance can well afford to pay if there has been misrepresentation on their part; while, if they are confident they can prove the correctness of their public assertions, then they will show alacrity in accepting the challenge, both in their own interests (the trading value to them of winning would be great) and in those of the Red Cross Society, by relieving the funds of the British Commercial Gas Association under the conditions set forth in the challenge [see p. 351]. The advertisements are a condemnation of, or a slander upon, all the gas-cookers now in the possession of gas consumers; and this sort of thing cannot be allowed to continue. The assertions of the "Multicooker" people simply mean that at least 75 per cent. of the B.Th.U. generated on combustion of the gas are squandered under the ordinary system of use. Another aspect of the matter is that it is the duty of the gas industry, if satisfied that claims of this kind are spurious, to defend its patrons; and very good grounds exist in the present case—grounds provided by tests already carefully made—for confidence that the claims cannot be defended. The "Multicooker" people have already declined an opportunity of proving their claims by tests being conducted in the presence of independent third parties; whether they will show greater courage now has not yet transpired. Meantime we have our doubts.

Carbonizing Temperatures and the Yield of Ammonia.

The investigators into the question of the relation of the production of ammonia to carbonization practices are, in the opinion of Mr. G. T. Purves, enabling those interested, by piecing together the evidence advanced, to draw the conclusion that there is a reasonable prospect of still higher ammonia yields being obtained. This opinion is found in the address of Mr. Purves to the Scottish Juniors which we published last week. He draws upon the work of Lewes, Tervet, Cobb and Hollings, and Burgess and Wheeler, and makes investigation on his own account Tervet has shown that hydrogen acting on red-hot coke may play a material part in increasing the ammonia; while Burgess and Wheeler have pointed out that during carbonization, at temperatures between 750° and 800° C., there is a large and sudden increase in the hydrogen evolved. Therefore at between (say) 750° and 850° C., the ideal conditions are presented for the Tervet reaction. Of course, the temperature rises rapidly after 800° C. is reached. But if the carbonizing mass could be maintained at about the temperature range named, it might be expected that a considerable increase of ammonia would be obtained. Indeed, under this condition, Mr. Purves has found a large increase in the yield of ammonia. He is convinced that it would be very easy to secure the necessary conditions with continuous vertical retorts and realize a "considerable" increase in ammonia. In considering the point, one must not confuse the temperature of the mass undergoing carbonization with the temperature of the retort walls. In the 1910 report of the Refractory Materials Committee, it was mentioned that a large number of measurements of retort temperatures had been made, and that the average maximum was 1909° Fahr., and the minimum maximum 1558° Fahr. In Mr. Purves' experiments, he found that the temperature on the flame side of the oven walls was 1050° (1922° Fahr) and 1080° C. (1976° Fahr.); but at the end of the carbonizing period, the temperature of the bulk of the coke was rather more than 900° C., or 1652° Fahr. This, be it noted, is at the end of carbonizing in the coke-oven; and yet it is not a great distance from the temperature range mentioned as being the ideal one for the Tervet reaction.

Munich Chamber-Ovens.

Speaking of coke-oven working reminds that the members of the Manchester Junior Gas Association have had, as reported last week, a very instructive visit to the Darwen Gas-Works, the chief object of attraction of which visit was the Munich carbonizing chambers as applied to gas making for town supply. How time flies is again illustrated by the fact that these chambers have now been in operation some eighteen months; while it does not seem much more than that since we were feeling some commiseration for the Engineer (Mr. A. H. Smith) over the delay he, through the war, was experiencing in getting the structural work completed. However, the four sets of chambers are working well, although more particulars would be required than have yet been published to contrast the working with those of other systems. For instance, the make of 12,650 cubic feet per ton of 529 B.Th.U. gas is equalled by other methods of working. But, of course, the character of the coal has to be taken into account; and on this point there is no information in our report. The coke is no doubt of more suitable character for industrial purposes than gas-works coke from any of the ordinary systems. As to how the other products stand, we have yet no account, and detailed working costs are also absent; though the report of last week mentioned that little labour is necessary, while only 28 seconds are expended in making a charge. However, Mr. Smith states that the more he studies the question, the more he is satisfied that he was right when his choice fell upon this type of plant; and if the time comes for him to make a further extension of carbonizing plant, he will certainly recommend his Committee to put in another unit. This is good testimony indeed; it would not be given except on excellent grounds. At the same time, we shall look forward with interest to complete working details.

Coal Deliveries in Winter.

In his address to the Yorkshire Junior Gas Association last Saturday, Mr. J. E. Lister Cooper, of the Yeadon and Guiseley Gas Company, referred among other topics to the scanty security that the smaller gas undertakings possess in regard to coal deliveries this winter. Nor does he like the new contract clause which provides for uniform monthly deliveries during the year in order to relieve the winter months by taking a larger proportion into store in the summer time, which, in war circumstances, is a very proper thing to do. He points out that, in the case of a small works using 10,000 tons of coal a year, and 60 per cent. of the quantity between October and March, there will be 1000 tons which will have to be put into store and taken out again, at an extra cost of 2s. to 4s. per ton, in the present condition of labour. What if it does cost this additional, it is better than running risks; and Mr. Cooper himself confesses to a feeling of insecurity over the position this winter. Those gas managers who have got the coal in store have more reason to be thankful despite the extra cost of handling; those managers who have not the larger stocks provided by equal monthly deliveries may have some sleepless nights before the winter is over.

Gas-Works Directory and Statistics for 1916-17.

Quite an old friend—for it has reached its thirty-ninth issue—is the "Gas-Works Directory and Statistics" issued annually by Messrs. Hazell, Watson, and Viney, Limited, No. 52, Long Acre, W.C. In the garb of its predecessors, and containing the same useful items of information as they, the issue for 1916-17 has made its appearance, revised up to August last. The book contains, among other things, a list of chairmen, managers, engineers, and secretaries, and lists of associations, at home and abroad, of engineers and managers. As to the index of officials, readers will note with mixed feelings the remark of the editor of the directory that this has undergone considerable changes, owing to the fact that many of those whose names have previously appeared in the list have either passed away or are fighting for their King and country. Considering the amount of labour which the compilation of such a work entails, one can well understand that the present edition of the directory is presented "with the satisfaction of having surmounted many difficulties." Even thus, however, without the earnest co-operation of the officials themselves, the task would, of course, be an impossible one; and in the present time of shrunken staffs, the thanks so frankly bestowed by the editor must be more than usually well deserved. The price of the directory is, as heretofore, 10s. 6d. net.

Mr. Jones's Lecture Repeated in Cardiff.—The lecture by Mr. H. E. Jones, on "The Gas Engineer of the Last Century," an account of which appeared in the "JOURNAL" for Nov. 7, was re-delivered last Friday at Cardiff At its close, on the motion of Mr. David E. Roberts (the Chairman), Mr. Jones was heartily thanked. In seconding the motion, Mr. George Clarry, the General Manager of the Cardiff Gas Company, alluded to the fact that Mr. Jones was President of the National Gas Council, a body which represented no less than 250 millions of capital.

CALORIFIC STANDARD ACT APPLICATIONS.

Decision in the Sheffield Case.—A Five-Year Revision Period.

In view of the editorial in last week's issue, headed "Calorific Power Applications and the Future," together with the report of the proceedings before the Board of Trade, on the Sheffield application for the substitution of a calorific value standard for the illuminating power one, readers will be interested in learning that the Board have decided to grant the 500 B.Th.U. asked for by the Company, subject to the right, at the end of five years, on the part of the Company to apply for revision to a lower standard, or the Corporation to apply for an increase. In will be remembered that the Corporation suggested at the proceedings before the Board that the standard should be 550 B.Th.U., though not desirous during the period of the war of doing anything to impede the Company in serving the national interests. Of course, an important point in the decision is the fixing of five years as the period at the end of which revision may be sought. This is a distinct concession to gas undertakings, in view of the attempts that have been made by local authorities to obtain the right (if 500 B.Th.U. was the standard fixed) to apply for revision within a few months of the termination of the war.

Tenth Official List.

The Local Government Board have received applications from the following local authorities for Orders fixing a calorific standard of 500 B.Th.U.

Rawmarsh Urban District Council.
Spenborough Urban District Council.

The Board of Trade have received applications from the following companies, who desire Orders specifying 500 B.Th.U.

Kingston-upon-Thames Gas Company.
Winchester Water and Gas Company.

PERSONAL.

Mr. W. A. Simco, who was for some years distribution clerk at the Stoke Gas-Works, and who went to Australia about five years ago, has recently been appointed Assistant Superintendent of the West Melbourne Gas-Works. After being in Australia a short time, he was made Manager of the Arrarat Gas-Works, and held the position for four years. Mr. Simco commenced his business career at the Stoke Gas-Works as a boy.

OBITUARY.

The War Office officially announce that Second Lieutenant Leslie Beaumont, West Yorkshire Regiment, previously reported missing, was killed in action on Aug. 18 last. Mr. Beaumont was 20 years of age, and was Junior Assistant Engineer at the Wakefield Gas-Works. He was formerly articled pupil to Mr. H. Townsend, the Managing Director of the Company.

The death occurred last month, after a brief illness, of Mr. Irvin Butterworth, who was for some years Vice-President and General Manager of the Detroit City Gas Company. Mr. Butterworth went to Detroit in 1903 from Denver; and (with the exception of a short period during which he was President of the Grand Rapids Gas Company), he continued his service with the Detroit Gas Company until 1913.

Much sympathy will be felt with Mr. Robert Porter, of Elland, in the irreparable loss he has sustained by the death last Wednesday of his wife, after an illness extending over five years. Gifted with strong will power, she was able almost to the last to fulfil her duties as she had always fulfilled them—in the noblest manner. Of her it is possible to write the best than can be written of any woman—that her life was one of unselfish devotion to her husband and family, and that she was always a true friend. Mrs. Porter was born in January, 1859.

The death is announced of Mr. John Storey, a former Town Clerk of Leicester. He held this position for some twenty years, starting in 1874. This period was one of great importance to Leicester in connection with its various municipal enterprises; the population having increased from a little over 100,000 to nearly 200,000; and the rateable value of the town from £250,000 to £675,000. He was largely responsible for preparing the case before Parliament for the large extension of the borough boundaries which took place in 1891; while the transfer of the gas and water undertakings to the Corporation was another important measure which Mr. Storey carried through Parliament.

ELECTRICITY SUPPLY MEMORANDA.

The electrical industry, like the gas industry, is having difficulty heaped on difficulty; and coal, oil, and labour costs do not constitute the aggregate. The supply undertakings have also their financial troubles. When the Treasury and the Local Government Board are kindly disposed, and there is complaisant granting of consent to the raising of a loan, the interest that has to be paid for it is now heavier than before. It was observed a few days ago that the London County Council have decided to raise the rate of interest for loans from 5 to 5½ per cent.; and this dearer capital is spent on plant and appliances that cost much more than prior to the war. The prices of some manufacturers' goods have gone up 20 to 30 per cent.—probably research would disclose cases of still higher percentage advances. Copper, too, is at a height in market value that makes electrical engineers say things about the scheme for Prussian domination of the world that are more forcible than polite; for it is due to the sanguinary essay to carry out the scheme that the electrical industry finds itself in such plight to-day in connection with copper. The German electrical industry (as mentioned in the "Memoranda" for Oct. 10) is also suffering from copper destitution, and so is using iron wiring in substitution. The Minister of Munitions at home has now given electrical engineers a fresh shock and a new incentive for studying the question of the employment of iron and steel for, at any rate, house wiring; for he has issued an order prohibiting the manufacture of any wire or cable containing copper, excepting for the purpose of certain contracts or orders—viz., those to which there have been allocated, by the Priority Branch of the Ministry, a reference number and priority classification within Classes "A" or "B," and those for the Admiralty, the War Office, the Ministry of Munitions, and the Post Office. Perhaps little mischief will be done to the electricity supply industry in view of the fact that money and goods are dear now; so that this is not the cheapest time for electrical development. The manufacturers of electrical goods and installation contractors will also find their work curtailed in consequence of the new order, unless they have in hand sufficient stocks, or can purchase from stocks already held by the wire and cable makers. One effect should be the release of more men for purely war work. It is "an ill-wind that blows nobody good."

Copper Wire and Cable Prohibition.

Happy are those electrical engineers who have plenty of spare plant. Fresh capital cannot be raised without the sanction of the Treasury or the Local Government Board; and shortage of plant cannot be met by extensions without good cause is shown in connection with munition work. This is a very big difficulty for some undertakings. Mr. W. W. Lackie, the Electrical Engineer of Glasgow, has very little margin between maximum demand and plant capacity; and, in a report pointing out that something must promptly be done to meet the situation, he has published a rather remarkable table, which shows what considerable variation there is in the margin of different undertakings. The percentage of spare plant over maximum demand in the case of Glasgow is 9, Birmingham 25, Edinburgh 80, Dundee 120, Leeds 60, Liverpool 90, Manchester 17, Sheffield 10, Charing Cross 100, Central 90, Chelsea 50, and City of London 50. The requirements of different districts—largely erratic some of them are, giving deep valleys and high peaks in the load curve—vary considerably; so that it is totally impossible to suggest a standard of margin that could have universal application, and all plant margins of the kind in an electrically prosperous district gradually waste away. The high percentages shown suggest modern extensions. But 90 to 120 per cent. excess seems to be a highly extravagant provision, while 9 and 10 per cent. margin is asking for trouble; and those responsible for some narrowly equipped concerns have not asked in vain.

Spare Plant Percentages.

The question of excess profits is being discussed with the Inland Revenue authorities by the electrical industry as it is by the gas industry. In the case of gas undertakings, it is hardly likely that many (if any) will find anything in the nature of an excess—coal having taken good care that there should be nothing of importance in the way of a surplus. Besides this, the prices charged the consumers for gas have, in most cases, only been increased just sufficiently to provide the revenue (supplemented in the case of companies by the difference in the sum required under the sliding-scale for dividend purposes) necessary for meeting additional outgoings. Mentioning dividend, there is peculiar hardship in the case of sliding-scale gas companies whose receipts are raised owing to an increase in the price of gas, but whose dividends are correspondingly reduced. The position is a singular one in connection with statutory undertakings. In the electricity supply industry, there are a large number of undertakings the managers of which devoutly wish they had excess profits to declare. Many of them could not before the war make the gross profits stretch themselves sufficiently to meet capital charges, let alone provide for depreciation and obsolescence, and leave a bit in reserve for troubled times. These undertakings are worse off now. On the other hand, there are concerns in industrial territory that are

Excess Profits.

working their generating plant almost to collapsing point (in fact, there are cases that have overstepped prudent limits); and these concerns no doubt, although costs have been considerably increased, have been raking-in additional profits, although at the expense of heavier wear and tear. These concerns are just now appealing to the Board of Referees dealing with the question of excess profits, on the ground that, as a class, they are entitled to special consideration in consequence of the limitations and restrictions under which they are working, and the fact that in the early stages of the undertakings it was impossible to earn an adequate return upon the capital expenditure involved. The claim is for an increase in the percentage allowed under the Finance Act. Practically the whole industry will be represented at the inquiry that is to be held. In respect of electrical goods, an application has been made by the British Electrical and Allied Manufacturers' Association for an increase in the statutory percentage of profit allowed. In this instance, the Board of Referees decided that the statutory percentage should be increased from the standard of 6 to 7 per cent. in the case of a business carried on or owned by a company or corporate body, and to 8 per cent. in other cases. It is explained that the higher figure in the latter case is due to the fact that the remuneration of partners cannot be deducted in arriving at a profit in the same way as the fees of directors.

The Bye-Product Magnet.

There have been columns upon columns of printed matter in the electrical papers and other organs of culture and learning on the subject of the gasification of coke in producers, with recovery of ammonia. It is evident Mr. A. H. Seabrook thinks that the fact that such a marketable commodity as sulphate of ammonia can be realized as the result of the process is not generally known to electrical engineers. If this be so, then they must have been blind to the attempts that have been made to impress the fact upon them. Mr. Seabrook, however, writes to reinform the readers of the "Electrical Review" of the point. That highly estimable paper, as readers of the "Memoranda" are aware, a short time since referred to the use of coke and coke-produced gas for the firing of boilers, and mentioned that the advantages of firing boilers by gas were the uniformity of firing and the avoidance of difficulties met with in burning coke in boiler furnaces. There was the sulphate of ammonia; and Mr. Seabrook wrote to our contemporary to point out that this was also a "great advantage," seeing that from 30 to 60 lbs. of it can be recovered per ton of coke gasified, because it contains from ½ to 1 per cent. of nitrogen. He procceds to quote figures approximately similar to others that have been previously published—such as that, gasifying coke in ammonia recovery producers, about 120,000 cubic feet of gas is realized per ton of fuel, with a calorific value of about 120 B.Th.U. per cubic foot. It is not supposed for one moment that Mr. Seabrook has had any personal experience of gasifying coke in the manner suggested; so that his figures are no doubt borrowed. He goes on to point out that the efficiency of the gas-fired boiler must also be greater than that of a coke or coal-fired boiler, because the admixture of gas and air is under much better control, and air leakage is more easily prevented; so that a gas-fired boiler ought to work under laboratory conditions almost continuously. He has "recently seen some accounts of gas-fired boilers, where efficiencies have been obtained much higher than anything that can be done with coal-firing, even when the latter is carried out under test conditions. The boilers were specially designed for gas-firing [probably he is referring to the Bonecourt system], and not coal-fired boilers, adapted to gas-firing—the latter method will not give a better efficiency than coal-firing." But there are the bye-products, which constitute the magnet that is drawing the electrical engineers. But before they go into this, they would be well-advised to study the premises provided by commercial values, as neither current prices nor pre-war prices may be ruling after the war.

Linking-up under General Consideration.

The question of linking-up electricity undertakings is occupying attention the country over. The allusions we have previously made to the subject have referred chiefly to London and the suburbs and Lancashire and Cheshire. But circular-letters as to interlinking have been sent out generally to electric concerns, committees of engineers have been appointed for different areas, and meetings have been convened for discussing the general position. The committees are, after taking counsel with the engineers of all the local undertakings concerned, to report their views to the Joint Committee, in order that any recommendations put forward in one area may be co-ordinated with those of other areas. As we have mentioned before, the experience is that there is economy in interconnection of electrical systems, and so far as collapses are concerned that are due to mishaps at generating stations, the inconvenience of these should be largely averted where systems are interlinked. Defects in distribution plant are another matter. If there is trouble on a distribution system, then, until rectified, there will be no gain in having alternative sources of supply. The Lancashire-Cheshire schemes, it was lately seen, are of considerable magnitude; and now it is observed that a meeting has been held at Leeds to consider a question of a scheme for Yorkshire. In the county there are 40 electricity undertakings, 30 of which are municipally managed. The interest in the proposal was shown by the fact that 38 of the 40 undertakings were represented. A strong Committee was appointed, charged with the duties of making full inquiry and reporting at another meeting. News from farther north and away down south shows that "linking-up" supplies a prominent place in current electrical politics.

"Tricity" Inventor on Cooking and Heating.

The Association of Supervising Engineers have had a paper from Mr. A. F. Berry, the inventor of "Tricity" specialities. The subject was electric cooking and heating; and the lecturer was in temperate vein, and in some of his points original. He reckons that of every 10 tons of coal delivered to a house, some 8 tons are burned in the kitchen. It is also, he asserts, "fairly" clear that 1 ton of coal consumed at the electricity generating station suffices to do the cooking that ordinarily requires 10 tons of coal in a private house. The pressure of the times is too great to allow any attempt being made to check the computation; but we straightway hazard the view that the expense of the electricity that would perform the equivalent in thermal work of the 10 tons of coal would be greater than the bill for the latter. However, the point is interesting. It is a very old argument that there is economy in fuel distribution and storage, and in domestic labour by using gas as fuel instead of coal. Mr. Berry adopts it for electricity. He also asserts that it has been "conclusively" proved that, in ordinary households, the cost of cooking a joint of (say) 10 lbs. with gas, coal, or electricity is of the order of 2d., taking coal at £1 per ton, gas at 3s. per 1000 cubic feet, and electricity at 1d. per unit. In these circumstances, Mr. Berry does not see that the possibility is great of effecting much saving from the fuel point of view—that is to say, by using electricity instead of gas or coal. In other words, Mr. Berry declares that 6840 B.Th.U. electrically generated will do as much work in the oven as 28,000 to 30,000 B.Th.U. generated from gas. Baking or roasting does not constitute the whole of the cooking work. There is the 60 to 75 per cent. of cooking and boiling that is done on the top plate. And there the electric-cooker is really a wicked prodigal. We do not see from the report before us that Mr. Berry touched this point. But he did the question of "meat" wastage. That dear old body Mrs. Beeton was appealed to; and Mr. Berry contends that approximately some 25 per cent. more meat is purchased than need be if only electrical operation was always practised. He does not tell us what happens when there is no care in regulating the temperature of the electric-cooker, nor what occurs when equivalent temperatures are used in a gas and electric cooker, and cooking proceeds at an equal rate. Mr. W. R. Rawlings, in the discussion, got close to this point when he stated that electrically "roasted" meat often looked as though it had been boiled. Mr. A. P. Trotter expressed the view, formed from experience, that electric-cookers should be periodically visited by a competent electrician; that parts of cookers should be easily replaceable; and that care should be taken in ensuring efficient earthing. Regarding the heating of rooms, Mr. Berry informed his audience that a great deal of the life of a fire is directly due to the different refrangibilities of the various vapours and heated air through which the burning fuel is seen, and also to the varying degree of redness caused by the play of air upon the fuel. These effects Mr. Berry has endeavoured to combine in the "Tricity" flame fire; and he modestly says that "the result gives a breadth of effect, and simulates in a perfectly natural manner the appearance of a coal fire at its hottest." He warned, however, that "it must not be expected that the 'economy' alone of electric heating for rooms will force it upon householders in the way that electric cooking will do." He hopes that in time something less than 2½ units of electricity will be made sufficient to warm a room, the size of which is not stated in the report. Having omitted to mention how he proposes to heat large quantities of water, Mr. Berry replied to an interrogation that electricity could not compete with a self-contained coke-boiler, which, by an expenditure of 1s. 6d. to 2s. a week for fuel, would supply more hot water than was usually required.

An Acetylene Committee.—The Home Secretary has appointed a Committee to consider the existing regulations in regard to cylinders of dissolved acetylene compressed into a porous substance, and to suggest amendment of these regulations where this appears desirable.

Monazite from Travancore Minerals.—In the course of the discussion on Mr. S. J. Johnston's paper read at the July meeting of the Society of Chemical Industry [see "JOURNAL," July 25, p. 168], some criticism was offered on the author's estimate of the cost of producing 90 per cent. monazite sand from the Travancore Minerals Company's concessions. The author (who was not present at the meeting) has since replied that he has every reason to believe that the figure he gave—*i.e.*, £4 per ton f.o.b.—is very nearly correct. This amount does not include such items as royalty to the Travancore Government, directors' fees, office expenses, agents' commission, &c. He understands that for a number of years, until shortly before the outbreak of war, the sand was regularly produced for the Company, by a contractor, at a price very close to the amount quoted above. The other concessions recently granted, in Travancore, he states, are to be operated by a Company called Hopkin and Williams (Travancore), Limited, while Thorium, Limited, will confine its attention to the manufacture of thorium salts and allied products. The latter Company is manufacturing thorium nitrate from monazite sand; but he understands that "it is premature to state that this is being obtained from the recently granted concessions in Travancore."

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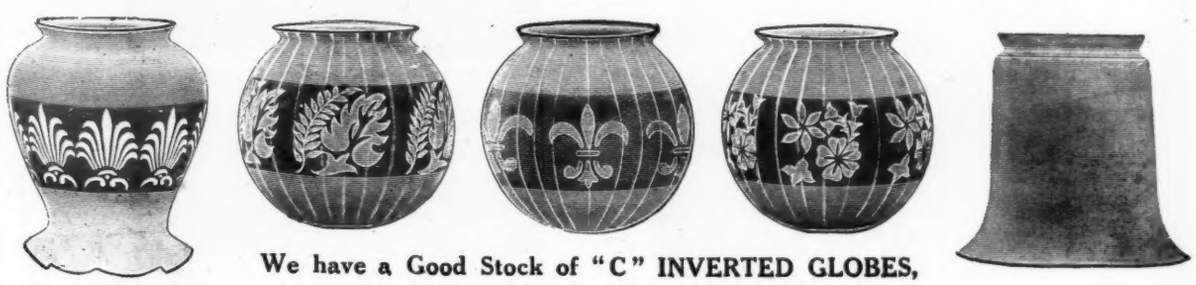

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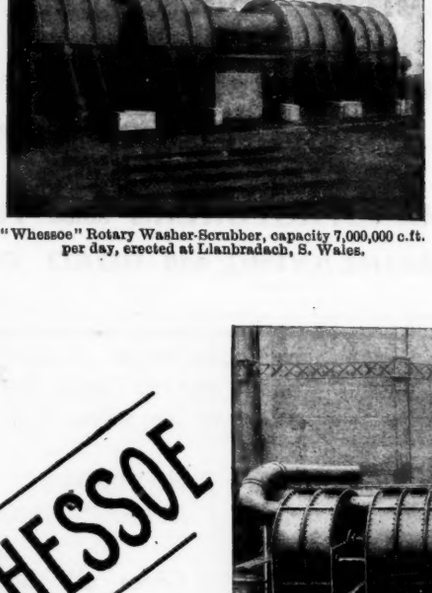

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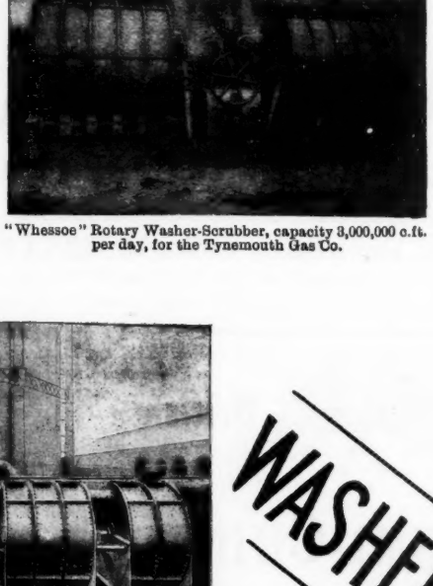

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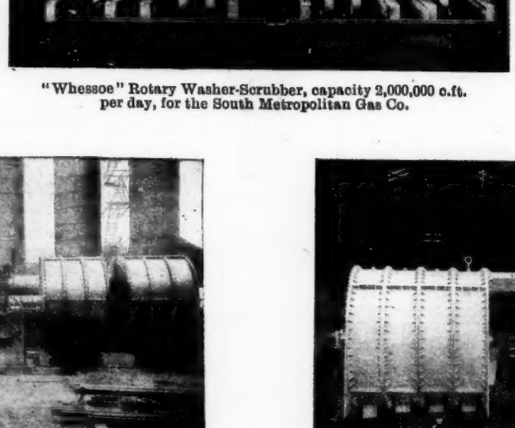

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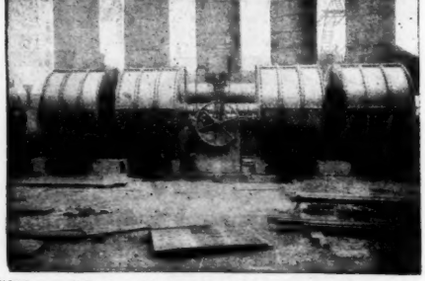
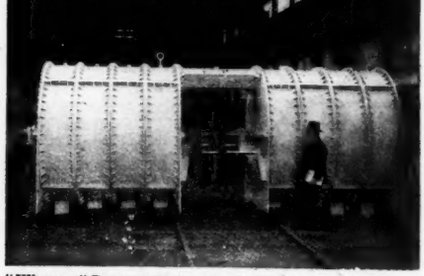
"Whessoe" Rotary Washer-Scrubber, capacity 2,000,000 c.ft. per day, for the South Metropolitan Gas Co.



"Whessoe" Rotary Washer-Scrubber, capacity 7,000,000 c.ft. per day, for the Gas Light and Coke Co., Beckton.



"Whessoe" Rotary Washer-Scrubber, capacity 1,000,000 c.ft. per day, for the Stourbridge Gas Co.

All Capacities *Prices on Application.*

AMERICAN GAS INSTITUTE MEETING.

Some Matters that were Discussed.

MANY plans and much preparation had been made for the eleventh annual meeting of the American Gas Institute; but the success which was declared on all hands to have attended the arrangements must have amply repaid all the trouble that had been taken. The Congress Hotel, Chicago, was the headquarters of the convention; and here, between Oct. 17 and 20, was discussed every kind of problem by which the gas man is being confronted to-day. And, of course, there were other items; for however strenuous the business life of an American may be, he is by no means a believer in all work and no play. The attendance numbered between six and seven hundred; and of these something over a hundred journeyed to Chicago on board a special train which was run from New York City for the occasion.

A cordial welcome to the city having been extended to the Institute, some more or less formal business was transacted, and then there came the presidential address, which dealt with the importance of the gas industry from various aspects, and also with the increased cost of labour and material which is being experienced in the States as well as in this country. It is gratifying, too, to note that a eulogistic tribute was paid to the work of the late Sir Corbet Woodall.

The President was Mr. W. E. M'Kay, the Vice-President and General Manager of the New England Gas and Coke Company, and Consulting Engineer of the Boston Consolidated Gas Company. He is succeeded in the presidency of the Institute by Mr. A. E. Forstall, who, after holding various appointments in the industry, went nearly twenty years ago into practice as a Consulting Engineer. In addition to the President, the affairs of the Institute are in the hands of five Vice-Presidents, a Board of Directors, and last, but not least, the Secretary and Treasurer (Mr. G. G. Ramsdell). The Vice-Presidents for the year, including last month's meeting, were: Illumination Section, Mr. C. O. Bond; Accounting Section, Mr. J. P. Crowley; Chemical Section, Dr. A. H. Elliott; Manufacturing Section, Mr. Herman Russell; and Distribution Section, Mr. J. D. von Maur. There is a Technical Committee, consisting of the five Vice-Presidents and nine other members; and in the hands of the former was the preparation of the programme and the obtaining of papers for the various sections. In their report, the Committee referred to the reports of the different Sub-Committees, whose work generally they recommended should be continued.

An early feature of the gathering was a strong plea by the President of the Illuminating Engineering Society (Mr. W. J. Serrill) for an increase in gas membership of his organization. Following this, the presentation and discussion of Committee reports and papers was proceeded with.

REPORTS OF COMMITTEES.

As is usual, a large number of reports of Committees were submitted—most of them not of a very lengthy character. Taking them in alphabetical order, the first is the report of the Committee on Carbonization, which is reproduced on p. 343. The Committee endeavoured to obtain figures showing operating results from as many as possible of the horizontal, inclined, and vertical settings and bye-product oven plants built in recent years. Further, they sought information as to the means adopted by the principal companies for the marketing and delivering of coke. The result of their work is embodied in two formidable-looking tables, some portions of which we print with the report. As for the Committee on Chemical Tests, during the past twelve months they have directed their activities chiefly towards the revision of the "Gas Chemists' Handbook," compiled in 1914 by Mr. W. H. Fulweiler; while the report of the Committee on Classification of Gas Engineering is, they point out, really a report of the Joint Committee on Classification of Technical Literature comprising 32 national associations, rather than of the Institute Committee themselves.

The first subject taken up by the Committee on Consumers' Meters is that of meter connections; a table of sizes in general use being submitted which it is recommended that the Institute should adopt as a standard. Attention is called to the advisability of using a round meter-nut, instead of the customary hexagonical one, both on the score of cheapness and because customers find it less easy to manipulate the round nut. The principal work of the Committee has, however, consisted in obtaining information for statistical data, with the object of answering certain questions propounded to them for their consideration. The first question—"How often should a meter be brought in for test?"—is the subject of a number of tables in which the information secured from a number of the leading gas companies is included. The results of age tests on nearly 400,000 meters seem, the Committee say, to show conclusively that certain kinds of gas do not have as deleterious an effect on meters as others. The meters used with natural gas give the best, and those with a mixture of enriched water gas and coal gas the poorest, results. Other figures indicate that the locality in which the meter is placed is as important as the nature of the gas passed through it. To sum up this part of the inquiry, the Committee say that, judging from available data, ten years would appear to be a sufficiently long period of time for any gas company to be satisfied to have their meters remain at a consumer's premises without having determined the proof of the meter, or having offered it the protection against corrosion that is afforded by a good coating of paint. Dealing with the conditions under which a meter brought in for test should be allowed to be re-installed, the Committee remark that their tables show that a large percentage of non-registering meters fail to register on account of the deterioration of the diaphragms; and unless a thorough examination is made of the meter when it is brought in from the district, the actual condition of the inside is not known. Different gases produce different results on the action of the diaphragms; and there can be no doubt that there is a maximum length of time diaphragms should be permitted to remain in meters in service. The importance is emphasized of capping the inlet and outlet of the meter when it is disconnected, and not permitting air to come in contact with the interior mechanism. The conclusion at which they arrive from their inquiry as to how long meters should be allowed to remain in service which pass very large amounts of gas or supply a fluctuating load, such as gas-engines, is that no general rule can be laid down. These are only a few of the problems with which the Committee deal.

Alluding to the work described in the report noticed in the above paragraph, the Technical Committee draw attention to the fact that the question of the deterioration of consumers' meters has received unusual attention during the past year in England; and they refer members to the work done as recorded on three occasions in the "JOURNAL." They recommend that a Committee be formed by the Institute to carry on work in the United States along similar lines, and for the same purpose.

The Committee on Gas House-Piping prepared a series of rules and specifications, so arranged as to be applicable, with very minor changes, to any situation. While the rules are for fitters and plumbers, they are so formulated that a final decision in any doubtful case rests with the gas company. In the suggested specification, it is noted that no pipe smaller than ⅜ inch is to be used. Other points are that unions must not be used on piping which is to be concealed (long screws or right-and-left couplings being stipulated for in these conditions); and that no pipe laid underground is to be less than 1¼ inches diameter.

The report of the Committee on Misleading Statements shows that useful work has been done during the past year, in the matter of contradicting erroneous statements appearing in the Public Press and elsewhere with regard to gas. To quote only one instance, an article appeared in a periodical on the danger from carbon monoxide poisoning, which was stated to have increased with the use of carburetted water gas. The Committee promptly issued a memorandum demonstrating that the vital statistics of various cities in which the gas supplied had been changed from coal gas to carburetted water gas, or from carburetted water gas to coal gas, did not indicate any material difference in the number of deaths from gas poisoning per 100,000 of the population when one kind of gas was substituted for the other.

The Committee on Nomenclature have for their main object the preparation of a glossary or special dictionary of the words and phrases which are used by those engaged in all branches of the gas industry, and which are not usually found properly defined, or do not appear, in the standard dictionaries. Their present intention, however, seems in one way to go somewhat beyond this, being the compilation of a special dictionary which shall be of maximum usefulness as a book of definitions, &c., for any of the hundreds of different employees or persons engaged in any work connected with the gas business. The Committee indicate their general plan of procedure; and a glance at this is sufficient to convince one of the magnitude of the task they have in hand.

A preliminary report of the Committee on Cast-Iron Pipe-Joints was submitted at last year's meeting of the Institute; and it consisted largely of a definite set of specifications for making cement joints. Further, the report embodied a recommendation that cement joints should be used in standard bells up to, and including, 8-inch mains, under all normal conditions. Since that report was presented, the Committee have been at work on experiments in different directions to enable them to draft up a final report covering specifications for joints under all ordinary conditions. An interesting point that has struck them is the small use that is made of any special form of cast-iron pipe-joint. Turned and bored pipe seems to be entirely absent from the States; and flange pipe is used to a very limited extent. One small stretch of plain-end pipe with special couplings was reported; while, as far as could be ascertained, no threaded cast-iron pipe is being employed. The use of the combination cement and lead joint is being extended. Several places have almost completely gone over to the use of steel pipe with welded joints. The Committee propose to continue their investigations, with a view to presenting a final report as early as possible.

The Refractory Materials Committee point with pardonable satisfaction to the fact that the third year of their existence sees the development and, to some extent, the accomplishment of the aims and purposes of the Committee. Very good progress has been made in the determination of the conditions which refractory materials must meet in practice, particularly with respect to those in coal-gas installations; and close approximations have been made regarding the qualities which such material must possess in order best to meet these conditions. Determination of reliable and practical methods of making the desired tests has been undertaken by the Bureau of Standards. This work, it is confidently expected, will be concluded during the coming year. A recital of some other matters now being, and to be, dealt with shows that the Committee have much useful work on hand.

Another important Committee is that on Standard Tests, whose task it has been to comply with a demand for comparable or uniform methods of stating the results of testing or operating a manufacturing unit or plant, so as to facilitate the study of the efficiency of materials, apparatus, and methods by comparing the results obtained at different times and places. A number of rules for testing are laid down in the report; and means for the uniform measurement of tar and ammonia, and for the measurement and testing of coke, are set out at length. Forms are given, too, for reporting tests of carbonizing plants and water-gas apparatus. These forms, if generally adopted, would result in securing fairly comparable figures.

From the title, it is not possible precisely to determine the aim of the Committee on Supplying Large Buildings with Gas. However, they explain that three years ago a Committee was appointed to deal with the question of piping large buildings for gas; and in 1914 a report was presented which was intended to give in detail the various reasons for, and arguments in favour of, the provision of such installations. Recommendations were made for the purpose of enlisting the aid of architects and builders, and of inducing the plumbing and contracting fraternity to recommend adequate gas-piping in all cases. Following the report, the Committee were re-appointed under their present title, with instructions to consider the subject from the broad standpoint of supplying large buildings with gas, in addition to the matter of the piping of such structures. Attention was devoted to compiling a booklet such as would be suitable for distribution among architects and builders; but a work of this character, they say, will involve an expenditure which they are not prepared to accurately estimate. In any event, it could not be proceeded with until the standard house-piping specifications are completed and adopted, as it was intended to make this a part of the booklet. Their 1916 report they conclude with the remark that they believe "the present need is not so much for a booklet as for the awakened interest and aggressive action of the gas industry, and the intelligent use in local situations of the information already provided."

The final report which we have before us is a lengthy one by the Committee on Utilization of Gas-Fuel Appliances. In this, gas companies are again urged to confine themselves to gas-ranges that are built in accordance with the gas-range specification which is now a standard of the Institnte and the National Commercial Gas Association. This specification, they think, should be published in pamphlet form, as well as the gas-fixture specification, which recent approval by the American Society of Mechanical Engineers of the design of threads for brass tubing enables them to present in complete form. This fixture specification occupies about twenty pages of the report; and it is followed by a tentative one for flexible gas-tubing.

The Committee realize that increasing agitation in the cause of safety, the imposition of ever stricter requirements by fire prevention authorities, and a proper regard for the essential interests of the industry call for the production of a flexible tubing that shall be substantially as safe as rigid metal pipe. The component parts of the tubing they recommend (in their order from the inside to the outside) are to be: Rubber packed metallic core; waxed paper wrapping; braided-cotton fabric sheath, impregnated and coated on one side only with a gas-proof and gas-tight compound; waxed paper wrapping; braided cotton covering; and silk, silkaline, or cotton-finish covering. On the present occasion, the specification was submitted for consideration and criticism, in the expectation that next year it will be ripe for adoption as a standard of the Institute. Some remarks are made on the slip-joint; it being pointed out that when this is used no cock should be permitted at the consumption end of the tubing. They hope that ultimately this joint will be abolished; but realizing that this is not likely for some time to be the case, they draw attention to the standard slip-joint evolved by the Appliance Committee of the National Commercial Gas Association.

Meanwhile, the work is being carried on of developing a safety union joint to act as a substitute. This suggested joint is illustrated and described in the report. Referring to other matters, the Committee believe there is need for further development in the States of gas fireplace heaters of the radiant fire or similar type so much in vogue in England; and for industrial purposes, they advise gas men to investigate the several systems now on the market in which a perfect pre-mixture of gas and air is made and delivered at the operatives' burners. Particulars of a test made by them in the Appliance Laboratory of the United Gas Improvement Company to determine the relative distribution and quantity of radiant heat emitted by various types of room heaters will be found on p. 338 of this issue. The Committee have also in hand a test comparing the efficiencies of several types of cooking appliances; but the data are not yet sufficiently complete to enable proper conclusions to be drawn at this juncture.

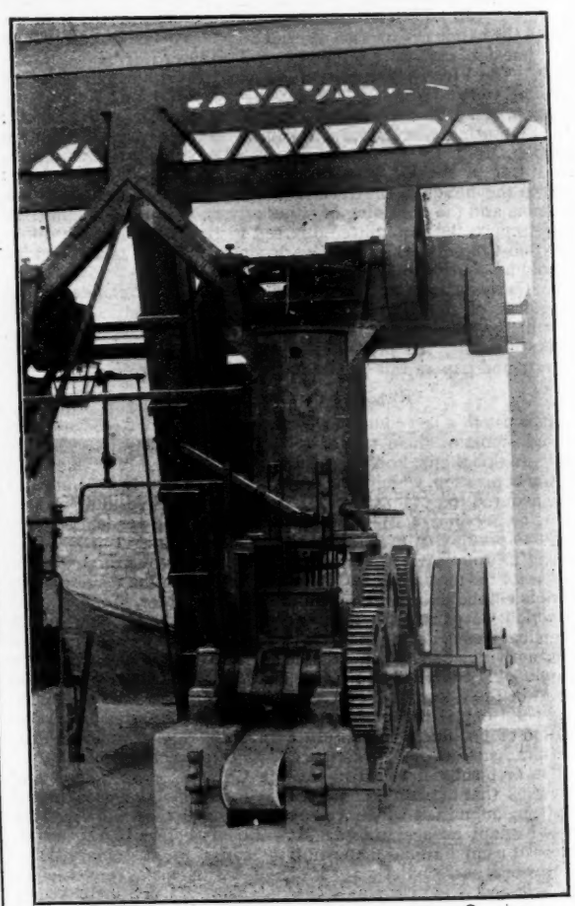
(*To be continued.*)

The great development of the water-works systems in Canada is represented by an increase in the number of plants in operation from 7 in 1867 to 528 in 1916. According to the "Scientific American," these have been built at a total cost of £24,800,000, and entail an annual maintenance charge of £900,000. There are 206 plants supplied from springs or wells, and 322 from lakes or streams. In 72 of them the water is filtered, and in 21 treated with hypochlorite. The municipality-owned plants number 396. Flat-rates are offered in 209 cases.

BRIQUETTING PLANT AT THE SMETHWICK GAS-WORKS.

THE turning of coke dust to good account, is a thing to be wished for in gas-works at all times; and just now a scheme which will accomplish this, and along with it assist in the utilization of pitch, is more than ever desirable. Such a scheme was referred to by Mr. Vincent Hughes, the Engineer of the Smethwick Gas-Works, at the meeting of the Midland Association of Gas Engineers and Managers last May, when the subject of the utilization of pitch was under discussion; and it is gratifying to learn from him that he is perfectly satisfied with the results achieved.

At Smethwick for some years the disposal of the coke dust was a great difficulty; it has ceased to be so any longer. The solution of the problem—namely, the making of briquettes—sounds simple; the real trouble lay in finding suitable plant. Mr. Hughes himself confesses that it took him some time to get hold of a plant which would answer his requirements; but, after numerous experiments extending over a considerable period, he was successful in the end. As a matter of fact, the plant which is now in operation at the Smethwick Gas-Works was ordered shortly before the outbreak of war; but unavoidable delays in delivery and erection prevented it being put properly to work until just over twelve months ago, since when nothing but the little troubles common to new apparatus has interfered with its smooth running. The makers of the plant are the Gordon Harvey Company, of Dowgate Hill, E.C.; and the installation now referred to is being followed by others of double the capacity at the Coventry and Northampton Gas-Works.

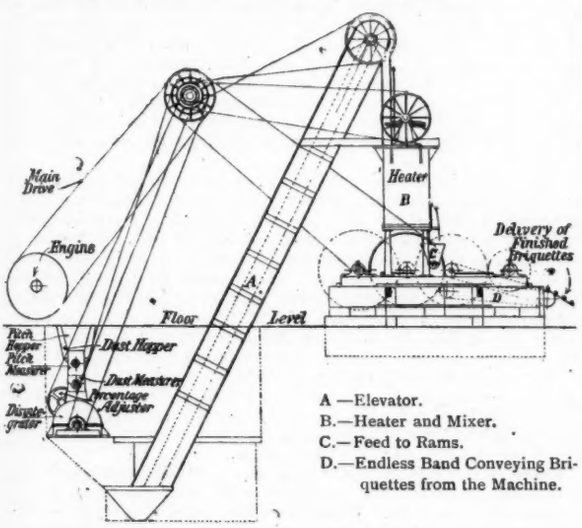


Photograph of One of the Briquetting Machines at Smethwick.

There are at Smethwick two complete machines; so that one can be cut out or both used, as required. Each is capable of turning out 10 cwt. of finished briquettes per hour, giving a capacity for the two of (say) 10 to 12 tons per day, which the makers reckon is sufficient for a carbonizing plant dealing with round about 40,000 tons of coal per annum. The coke dust passes through a ¼-inch mesh; and about 8 per cent. of pitch is mixed with it—the pitch and dust being fed through grids at the floor level, and the proportions automatically regulated. Then the mixture is ground to a fine powder in the disintegrator, and raised by means of an elevator into the heater, where a small proportion of tar is added.

The proportion of tar used is varied—say, from ½ to 3 per cent.—according to the coke dust employed and the use to which it is intended to put the briquettes; it being desirable that domestic briquettes should contain somewhat more volatile matter than

those for power purposes. In place of tar, crude petroleum can of course be utilized; but this is hardly likely to be preferred on a gas-works. The adjustment of the machine to the required proportion of volatile matter is very simple; the supply of tar being regulated by a tap, and the percentage of pitch by the feeding apparatus. The quantity of pitch has to be kept relative to the proportion of tar, as the greater the amount of tar put in the more difficult is the mixture to bind. Especially in these days of dear coal, briquettes are very useful for household purposes; and as to power, Mr. Hughes takes his own prescription, for he employs them exclusively under all his boilers, finding them excellent for steam-raising. They are also eminently suitable for heating apparatus in greenhouses, churches, and similar buildings; and they are, Mr. Hughes states, being taken up by the steam-lorry transport people, who speak very highly of them, and propose adopting them extensively, as they last much longer than coke, make no clinker, and consequently enable longer journeys to be undertaken without replenishing the fuel-bunkers. Mr. Hughes has experimented with various mixtures, and has also tried using the briquettes for heating retorts and in the manufacture of water gas. Details of these tests we shall hope to receive when quieter times bring him sufficient leisure for their preparation.



A —Elevator.
B.—Heater and Mixer.
C.—Feed to Rams.
D.—Endless Band Conveying Briquettes from the Machine.

But to return to the apparatus. In the heater, to which the coke dust and pitch are elevated from the disintegrator, and where the tar is added, the material is steamed, and thoroughly mixed by revolving paddles. High-pressure steam is necessary; and it should not be at less than 100 lbs. per square inch, as wet steam is detrimental to the quality of the briquettes. In a few minutes, the mixture is raised to the requisite temperature, and is then delivered into a hopper over the rams by which the briquettes are formed and pressed into the desired shape. When this process is completed, the briquettes fall on to a band conveyor, which removes them from the machine. In spite of the fact that it has been subjected to a pressure of about 6 tons, the briquette is at this stage somewhat soft; but as the steam evaporates and cooling takes place, the material gets hard as stone.

The great trouble the makers have experienced in briquetting coke dust is the amount of wear and tear on the machine; but this they have overcome by introducing the hardest manganese steel for the wearing parts. In addition to the gas-works named, it may be mentioned that the Gordon Harvey Company are fitting up an installation in connection with a large coke-oven works.

As to the briquettes themselves, the following independent analysis made for Mr. Hughes by a well-known firm of engineers may be quoted. The high amount of ash shown in the analysis is without doubt the result of the inferior coal which the collieries are forwarding to consumers at the present time.

Analysis of Sample of Smethwick Briquette.

Percentage Contents of	As Received.	As Dried.
Volatile matter	10·99	11·59
Coke	83·82	88·41
Ash	16·19	17·08
Fixed carbon	67·63	71·33
Free moisture	..	..
Hygroscopic moisture	5·19	..
Sulphur (separately determined)		

Thermal Values.	Available as Received.	As Dried.
Calorific value	10·850	11·816 B.Th.U.
Carbon equivalent	..	12·065 B.Th.U.
Evaporative power	11·23	12·24 lbs. of water from and at 212° Fahr. per pound of coal.

The sample consisted of one 6¼ oz. avoirdupois cylindrical fuel briquette of moderate hardness readily pulverized to "smalls," which passed a ¼-inch mesh sieve. The volatile matters burned with a somewhat long, bright, lasting, smoky flame. The coke produced rom the powdered fuel was dark grey, moderately hard, compact, and dull. The ash is ruddy-brown colour.

THERMAL PROBLEMS FOR GAS ENGINEERS.

XV.

By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S.

THIS series of papers is now concluded, at any rate for the present, though the subject is by no means exhausted, as the same line of study might be carried on in connection with the combustion of raw coal, condensation, wet and dry purification, and utilization of residuals. Enough has, however, been said in illustration of the arguments advanced at the commencement. The object in view has been the importance of thermo-chemistry in connection with the gas industry; and to this end—after a preliminary review of subjects such as temperature, pressure, weights and measures, specific heat, calorific value, and some special properties peculiar to hydrocarbons—attention has been directed to blue water gas, oil gas, combustion of coke, carburetted water gas, coal gas, and the combustible mixtures known under the generic title of "town gas."

In closing, I would take the opportunity to express grateful appreciation of the courtesy shown by those who have been sufficiently interested to criticize these articles, not only through the columns of the "JOURNAL," but by way of private correspondence, or to assist by information or replies to inquiry.

Mr. E. W. Smith [See "JOURNAL" for Aug. 8, p. 258] suggests that the source from which the data in the tables are derived should be stated in each case. This matter was considered when laying out the original scheme, and that from two points of view—the possibility of in all cases furnishing such information, and the degree of utility or interest attaching to same if published. As to the first point, the figures in question have been collected from all available sources during several years, and chiefly for private use. In addition to personal memoranda of this nature I may mention many lectures delivered by authorities such as the late Professor Vivian B. Lewes, as reported in the "JOURNAL," and verified by reference to an extensive collection of chemical literature, and the "Transactions" of the Chemical Society and the Society of Chemical Industry. It is by no means a general practice to quote the original for items such as the calorific value of a gas, and, indeed, these particulars are not always retained. In view of these facts, the better plan seemed to be the entire omission of authorities; and excellent precedent can be quoted for this course. Further, it appeared that frequently these details would be a wearisome break in the arguments; and I have a perhaps unreasonable prejudice against marginal or foot notes, as they would extend the already large amount of space kindly granted me in these days of restricted paper supply.

On the score of utility or interest attaching to quoted authorities, anyone who has taken a course of instruction in inorganic chemistry knows where to find the original for statements as to the chemical or physical properties of elements or gases, and probably those who do not know are just the ones who prefer the plain facts, without any extraneous embroidery. Complete quotations of authorities are desirable in a classical or an educational treatise. But I have endeavoured to make it clear that this work does not aspire to anything of that sort; and if the effect is to secure more attention to the standard literature on the subject, one of the points in view will be achieved, because some people are talking about the need for research in a tone that rather implies that such a necessity has now been discovered for the first time, and that little or nothing has been done on these lines in the past. The columns of the "JOURNAL" tell a different story. Mr. Smith and others have kindly directed attention to *errata* as follows: Table III., column No. 3, the specific gravity of propane should read "22." Table V., headings of columns Nos. 1, 2, and 3 read "Inches of Mercury." Table VII., column heading of column No. 5, read "2000° C., 3632° Fahr." The temperatures not specified as C. are so obviously Fahr. that it was not thought necessary to mark them.

Mr. Harold E. Copp in the issue of the "JOURNAL" for the 8th ult., p. 32 (together with private correspondents) seems to think that it is necessary to point out that the results mentioned for oil gas and for carburetted water gas have been exceeded in practice. These were not claimed to be the last word, or to represent the limit. As experience accumulates, one may look for improvements in yields from coke and oil similar to those recorded in the case of coal, which have attained a position that was not anticipated even twenty years ago. And reasons were stated, in connection with carburetted water gas, for expecting that, contrary to the usual experience, the practical results might exceed those indicated by theory. The practical results set forth are not the outcome of special tests, but plain everyday working extending over long periods, and including contingencies such as inexperience and negligence of workmen, differences in quantity of coke available, difficulties as to steam supply, and other matters that enter into the daily routine of small gas-works.

In works of insufficient magnitude to warrant the employment of constant and skilled supervision in each department, the average year's working results, either in the retort-house or the generator house, rarely come up to the degree indicated by the short-period trial tests conducted under special supervision, starting all new, and when the whole detail is under the limelight. The year's revenue account is influenced by the former rather than the latter. I am not making special allusion to Mr. Copp or anyone else in remarking that gas engineers may well consider the desirability

of exercising discretion and caution in the publication of working results of a phenomenal character, based on short-period special tests, because directors and shareholders are apt to look for a reproduction of them in the official forms of annual account.

All statements as to the photometrical value of gas, candle value per ton of coal or per gallon of oil, &c., turn upon the description of burner by means of which the figures are ascertained; and I am at fault to the extent of having omitted to mention that the 6⅝ candles per gallon of oil, as obtained in the carburetted water gas process, was based on the No. 1 "London" argand, which was used, not as being best suited to this description of gas, but because the gas was supplied and officially tested by that make. The No. 2 "Metropolitan" argand has now been employed for some years for general laboratory purposes, and will afford anything up to 25 per cent. greater photometrical value as compared with the No. 1 "London." That this is due to a regulated air supply may be proved by adjusting the same on the old make of standard burner, as may be done by piling pennies one on the other under the centre opening until the maximum result is secured, or by placing a smoke protector of talc on the top of the glass chimney fitted with a "hit-and-miss" adjustment. The air supply to the normal No. 1 "London" burner is excessive for most gases other than straight coal gas of not more than 11,000 cubic feet to the ton of coal carbonized. This point should especially be kept in view when comparing modern tests of candle value with those of an earlier date.

VIBRATIONS FROM GAS-ENGINES.

In a recent issue of "Engineering" was a note on this subject founded on the experiences at the electricity works of La Chaux-de-Fonds, Switzerland, where there were installed in 1899 two gas-engines of the Gasmotorenfabrik Deutz, each developing 250 H.P. at 180 revolutions per minute.

They are four-cycle engines with two parallel cylinders and cranks at 360°; each motor directly driving a dynamo. Each of the two units had to be erected on a block of concrete, 7 m. by 9·5 m. and 6 m. high, as the soil consists of loam and marl to a depth of 20 m. Soon after the installation the houses in the neighbourhood—especially those built on the same marl—were disturbed by vibrations, described as unpleasant though not dangerous. The Deutz firm fixed balance-weights to the crank arms and to the flywheels. The result was that the wave length of the vibrations was altered, and that other houses were shaken. In order to reduce the trouble, the motor speed was lowered to 165 revolutions. This involved a very great sacrifice of power, of course; but as the motors were rarely wanted, nothing further was done until loss of water from the tank of a gas-holder near by suggested that a crack had developed in the tank. The crack had probably been formed when a deep excavation was made near the tank; but it had apparently been widened by the vibrations, for the running of the motors certainly increased the rate of water loss. The motors were therefore stopped, and Dr. Stodola was consulted as expert. He considered the balance-weights to have been correctly estimated and placed so as to balance the horizontal reciprocating forces. But there were also centrifugal forces at right angles to the former, and not acting at the centre of gravity; and these forces tended to make the machines oscillate in pendulum fashion, together with their foundations, upon the elastic cushion of soil. To avoid the oscillations, Dr. Stodola suggested that the balance-weights should simply move in the horizontal plane, so that the centre of gravity of the system should remain in the same plane during the running of the engines.

His suggestion could be carried out in two ways—either a balance-weight might be added to each unit, so as quiet that unit; or the one unit might be balanced by the synchronous movements of the other unit. The adoption of the second method would have necessitated arrangements for ensuring a precise concordance of the two units and, further, an absolute rigidity of the foundations, which might have been secured by providing a heavy cast-iron frame round the two blocks of concrete. This solution was not tried, therefore. The first method looked simple, and was adopted. From the end of the shaft of each motor a balance-weight is so moved on horizontal guides by an auxiliary crank that the weight arrives at its dead-point at the same moment as the piston. The resultant of forces of the two weights had to coincide with the resultant of the forces of the piston—*i.e.*, it had to be placed in the central plane. A balance-weight placed in the middle between the two motors would have been simpler still; but this modification would have called for a replacement of the shafts and flywheels. The first-mentioned arrangement was hence decided upon, and carried out by the Locomotivfabrik Winterthur.

So far as is seen from the "Schweizerische Bauzeitung" of Sept. 23, this has been done only in the case of the one motor. But as the vibrations have been reduced to a minimum, although the motor is once more run at the original speed of 180 revolutions, the solution of the problem is considered to have been successful.

An order has, says "The Times," been promulgated in Paris by the Prefect of Police forbidding the lighting of shops by gas, electricity, or petroleum after 6 p.m.

RISE AND DEVELOPMENT OF BYE-PRODUCT COKING.—IV.*

[COMMUNICATED.]

THE HANDLING OF THE COKE.

A question which is worthy of much more consideration than it usually receives in connection with bye-product coking is the method of handling the coke produced. Several methods are possible, each requiring a totally different kind of accessory plant. These methods can be divided into two broad classes—viz., (1) with a coke-bench; (2) without coke-bench. In the former class, we have the horizontal and inclined coke-benches, with or without additional plant for mechanical handling.

In the earlier ovens on the Continent, the flat bench was much favoured. The coke was loaded by hand—being tipped over the edge of the bench into trucks beneath. In some cases this has been modified by having waggon roads underneath the bench itself, and loading the coke through a series of holes in the bench. With this type of bench much hand labour is involved, and any screening which has to be done before loading must be done on the bench by hand, and the fine coke dust subsequently removed. With the inclined bench, on the other hand, the assistance of gravity is called in, and there is less carrying of coke required; the inclination of the bench being such as to cause the coke to slide down to the bottom. Surplus quenching water readily gets away from an inclined bench, and, moreover, by having the lower plates perforated, the fine dust and small breeze are automatically removed.

Either the flat or inclined bench can be combined with a coke conveyor and loading machinery. This arrangement is adopted at several plants in this country. At the foot of the coke-bench is fixed a scraper conveyor or else a travelling belt. The coke is guided on to this, then, by means of a small elevator or inclined conveyor, passed over screens and loaded direct into trucks. This arrangement works well; but the upkeep of the conveyor is the objection to it. The wear and tear is very severe, and there is also the further disadvantage that, in case of a breakdown of the conveyor, usually it means a corresponding stoppage in coke loading, and ultimately of the ovens themselves. On the whole, general preference is expressed for hand loading in connection with the inclined coke-bench; and this certainly is a cheap and reliable method, and independent of any mechanical assistance which may be liable to get out of order.

There is certainly a tendency nowadays to do away with the coke-bench entirely, and substitute some mechanical means of dealing with the coke. Experience has resulted in considerable improvement on the earlier types of machines in use, both from the point of view of first cost and upkeep and also of reliability. Perhaps the most important factor, however, is the increasing difficulty with regard to labour; and this is by no means a small item in connection with coke loading. With a machine for the purpose, the number of men required is reduced to one-quarter or one-third of what it would be under the old system.

A type of plant of this class favoured in Durham is the inclined coke car. This car is really a section of an inclined bench which can travel backwards and forwards in front of the ovens—usually being attached to an endless rope and haulage gear. For convenience of handling and quenching, a twin car is provided; so that the coke can be spread out in thinner layers and be more easily quenched and screened. The car is hauled into position before the oven to be dealt with. When the coke is discharged and quenched, the car is hauled up an incline and the coke discharged from the car by opening discharge gates—the inclined bottom of the car causing the coke to slide out freely. The coke is passed over screens (the breeze and dirt being thus removed) and loaded direct into trucks.

Perhaps the most popular machine of this type is the Goodall combination machine for quenching, screening, and loading, several of which are in use in the country. There, again, the machine travels on a track in front of the oven, but differs from the coke car above in that it contains in itself the propelling machinery. The coke as it leaves the oven passes through a quenching hood attached to the machine, then on to a revolving table, by means of which it is well spread out and can more easily be completely quenched. By reversing the direction of rotation of the revolving platform, the coke is discharged, passed over a shaking screen, and loaded into waggons in one operation.

A type of machine of quite a different character is in use on the Continent. The coke is discharged from the oven into a large bucket or hopper, and when full this is lifted bodily and lowered into a tank full of water. The bucket is perforated, and as it is lowered the water rises and rapidly covers the coke. The bucket is then lifted; and the surplus water runs out quickly through the perforations.

With machines of any of the foregoing types, one or two men can easily handle the whole output of a battery of ovens. The quenching is usually more uniform and more expeditiously carried out than when done by hand on the coke-bench; and the coke itself, not being handled quite so much, is less liable to be broken up. The capital cost, maintenance, and wear and tear are not unduly high, all things considered.

The greatest disadvantage of any type of machine is the

* For previous articles of the series, see *ante*, pp. 126, 174, 291.

liability to break down, and also the fact that, once decided upon, the type of machine cannot be altered without considerable stoppage of the plant. With a coke-bench, delays are usually caused either by shortage of waggons or of labour. Whatever system of handling is adopted, the former trouble is always possible. With a bench, however, it is possible to go on pushing ovens for some time and allow coke to accumulate on the bench till such time as waggons can be obtained. A few extra men put on will soon clear the bench. With a machine, on the other hand, as soon as it breaks down the ovens are at a standstill, as it is not possible to discharge the ovens without the machine. Moreover, should the machine adopted prove unsatisfactory, no change is possible without shutting-down the plant. In spite of the disadvantages, however, mechanical handling is coming more and more into use. In America, a different arrangement has been successfully introduced. Quenching stations are provided at convenient points for the distribution of the coke. The coke is discharged into a quenching car, and this, with its hot load, is rapidly run to a quenching station, where the coke is quenched and discharged as required.

Upon the type of coke-handling plant adopted largely depends the method of quenching. With either form of coke-bench it is usual to pass the coke, immediately on issuing from the oven, through some form of quenching hood, and then to complete the quenching on the bench by means of a hand hose. The quenching hood—or Darby quencher, as it is more frequently named—is generally also incorporated on the quenching machine. The quenching of the coke is an important operation, and on it largely depends its suitability for well working the blast-furnace. The coke must be quickly and perfectly quenched without being overburdened with water. There must be no burning coke left, as this not only means loss of coke, but it spoils both the appearance and texture of it, and also increases the percentage of ash.

The operation of the Darby quencher requires considerable care. The water for this should not be turned on until the coke is actually entering the hood, and it should be turned off as soon as the ram-head enters the hood. If the water is turned on too soon much splashing takes place, and water may, and frequently does, come into contact with the hot brickwork of the oven wall. Constant repetition of this is bound to cause serious damage to the brickwork. As much water as possible should be got on to the coke by means of the hood; and it is desirable to let the ram travel very slowly in order that the hood may be made to do its work as effectively as possible. It is the practice on some plants to stop the ram for a few seconds every yard or so; but this practice is not to be recommended, on account of its adverse effect on the ram and driving gear. As soon as the coke issues from the quenching hood, whether a bench or machine is in use, the quenching should be rapidly completed by hand. By doing this, a bright, silvery looking coke is obtained. But if the hot coke is exposed to the air for more than a few seconds before quenching is completed, its appearance will be spoiled, and it will be very dark in colour. The aim should be to use just sufficient water to quench the coke thoroughly and leave sufficient heat in it to evaporate the surplus water, so that the coke is itself practically dry when cold. To attain this, it is essential that the coke should be well spread out, and not piled up to any great depth. This is a point to be borne in mind when considering any type of machine.

The coke, when quenched, should not contain on the average more than 1 or 2 per cent. of water. Even after being apparently quite quenched, fires will frequently break out in coke left on the bench, especially if there is a high wind, or if the coke is not well burnt off. To deal with outbreaks of this kind, a small hand hose should be provided, by means of which a fine stream of water can be directed on to the exact spot where the fire is. By using the ordinary large diameter quenching hose for this purpose, considerably more water than is necessary has to be used, with the result that much coke which is already cold gets soddened with water. The gully at the bottom of the coke-bench should be kept clear and free from breeze, dust, &c., so that the surplus water can get away quickly—this, again, helping to keep the average moisture content of the coke at a reasonable figure.

A "**Compound Gas.**"—According to the "Iron and Coal Trade Review," it has been asserted by Dr. W. Zimmermann, of Worms, that blast-furnace gas can be improved by blowing it through a coke-oven. By experiments he made with a small Otto coke-oven, he found that the gas mixture thus produced (for which he suggests the name of "compound gas") contained less carbon dioxide and less nitrogen than when the two gases were mixed cold in the usual way. At the same time, it contained more hydrocarbons, both light and heavy, and consequently had a higher calorific value—in one case as much as 13·6 per cent.—as compared with the cold mixture. Moreover, passing the furnace gas through the oven over the coked mass lowered the temperature of the nascent coke-oven gas, and prevented the decomposition of some of the ammonia already formed, a considerable amount of which was lost, especially during the last hours of the carbonizing period. According to the author, the yield of ammonia was increased by 25·2 per cent. as compared with that obtained from coke-oven gas in the ordinary way. The cooling of the coke-oven did not increase the amount of gas fuel required, nor prolong the carbonizing period (which is usually 36 hours), nor did the blowing of blast-furnace gas through the coke-oven have any effect on the quality of the coke produced.

HEATING AND VENTILATING PRIVATE DWELLING HOUSES.

In a paper read before the Society of Engineers on Monday of last week, dealing with the heating and ventilating of private dwelling houses, Mr. C. T. A. Hanssen put forward a good many admittedly Utopian ideas, and at the same time expressed a few opinions with regard to gas which called forth some protest from one or two members of the audience. While agreeing that the most convenient and most sanitary fuel for heating a house is undoubtedly gas, it was, he said, necessary that its cost should be very materially reduced before gas heating could become a practical possibility.

There was yielded from 1 lb. of coal about 14,000 B.Th.U. A ton thus yielded 31,350,000 B.Th.U.; while the calorific value of a cubic foot of gas was put at 535 B.Th.U. From this it was argued that a ton of coal was equivalent to 58,700 cubic feet of gas; and with gas at 3s. per 1000 cubic feet this was equivalent to coal at £8 16s. 1d. per ton! Gas was therefore, at present, far too expensive for continuous heating, and could only be used for cooking and temporary heating of rooms used on occasions. If producer gas were added to the present supply, and the mixture used exclusively for heating, distributed more continuously under higher pressure and with an increased velocity in the mains, it would be possible to distribute it at such a price that it could compete with coal—say, at 9d. or 1s. per 1000 cubic feet of equivalent heat value. The benefit of this to the community would be enormous in the way of the elimination of smoke, and the greater amount of bye-products available; and, looked at from this point of view, he regarded the universal use of gas for heating and cooking as one of the most pressing public needs.

Referring to the tests made for the Coal Smoke Abatement Society by Mr. A. C. Ackermann and Dr. J. S. Owens some years ago, the author pointed out that these did not show the amount of heat radiated from an open fire either of coal or gas, and he was not aware of any reliable radiation tests which had been carried out with coal-fires. With gas-fires, however, a great many tests had been undertaken by the two great London Gas Companies, and it seems certain that from an ordinary open gas-fire about 45 per cent. of the total heat of the gas was radiated into the room, according to the latest bolometer tests.

After setting forth the usual arguments against the use of open coal-fires, the paper concluded with a reference to the large wood fires so common in Russia and some other parts of the Continent. These are glazed tile stoves, about 5 feet by 3 feet in section and 9 feet high, provided internally with flues which lead to all parts of the stove, and heat the whole of it to a temperature that seldom exceeds 100° to 120° Fahr. The fire is only kept up a few hours every day, until the whole of the brickwork is heated. The air supply is then cut off by means of a damper; the stove remaining warm during the rest of the twenty-four hours, giving out a very pleasant heat. If a cheap supply of gas were available, a modified form of this Russian stove might, in Mr. Hanssen's opinion, become popular in England.

It should be built outside the chimney breast of the present fire-place, of ornamental glazed tiles, 6 feet wide by 9 or 10 feet high. The front of it should be closed by an air-tight door with mica windows; the fire should be an incandescent type, and with the air supply adjustable by hand; while the gas supply should be variable by means of an automatic regulator, in order to keep the temperature of the room uniform. Such a fire would utilize 80 to 90 per cent. of the heat of the gas, which would give the cheerful glow of the open fire, while the upper heating surface, owing to its large area, would heat the room to a very moderate temperature, and would lend itself to any form of decorative effect that might be desired.

For the rest, the paper discussed in considerable detail the general principles of ventilation, and made a number of suggestions as to the heat insulation of dwelling houses, with a view to avoiding the large percentage of the heat which is now dissipated through windows, doors, and walls.

DISCUSSION.

The President (Mr. Percy Griffith) said the point that appealed to him most was the suggestion that gas should be used for heating ordinary dwelling houses much more generally than is the case to-day. Being a shareholder in a good many gas companies, he was extremely anxious to see this ideal reached as soon as possible. He was doing his own little best at the present moment, because, on account of the high price of coal and coke, he was installing two gas-fires, or rather he was eagerly awaiting their arrival, because it seemed a difficulty to get anything at all delivered in these war times. With regard to the author's suggestion of a modification of the Russian stove, he could not help drawing a humourous picture of one of these rather formidable fires in the quite small rooms of an average flat. It seemed rather likely that the occupants would have to use another room, for it appeared that the proposed stove would occupy the best part of the room in which it was placed.

Mr. F. W. Dye said he would like to ask the author to modify his figures of comparative cost of coal and gas for heating purposes. With gas it was possible to rely on a working efficiency of from 75 to 100 per cent.; and there were very few coal-fires having such a working efficiency as this. The author's figure of 3s. for

gas also was not accurate. There were certainly places where gas cost 3s. and perhaps more; but of all the gas used in London he doubted if half of it cost as much as 3s. per 1000 cubic feet. It had to be acknowledged frankly that gas for continuous duty—*i.e.*, all day or day and night—cost more than solid fuel. At the same time, even this comparison between the use of gas and solid fuel depended on the cost of the gas. For instance, in Halifax, just before the war, gas was being supplied for all purposes other than lighting at 1s. per 1000 cubic feet. Consequently, there were large buildings in the town which were centrally heated with hot-water radiators and gas-boilers, the owners of which were quite satisfied with the cost. A few years ago the gas-fire passed through a very critical period of its history—indeed, it nearly died. The fires were made in such a way that they afforded only a small amount of radiant heat; the greater portion being high temperature convection currents, which somebody christened "desiccated air." This position, however, had all been swept away, and to-day there were gas-fires which gave an efficiency of 75 per cent., of which over 50 per cent. was in the best form of radiant heat from the luminous body, and the balance low temperature convection air warmed by contact with surfaces at a low temperature—not hotter than a hot-water radiator. The remaining 25 per cent. went up the chimney. But it was not lost, because it stimulated the ventilation, and represented what had to be paid for the ventilation of the room. Thus with a modern gas-fire there was comparatively little loss. The modern gas-fire had had introduced into it the injector ventilating principle, which was a means by which the ventilating effect of the chimney with the gas-fire was on all-fours with that given with a coal-fire. There were many types of fires with this principle embodied in them. In the past, also, the gas-fire had been very slovenly fitted—it was simply stood in front of the fire-place with a great gaping space around it. Thus the very large extracting effect of the chimney had not been interfered with. Gas-fires were now, however, being fitted in a much better manner—in fact, in the case of new houses they were built into them just as the coal fire-place in former times used to be. To obtain full ventilation of the room, however, it was necessary to have a door or window open; and this necessarily involved draughts. To overcome these, it had been suggested that the right way to start was to warm the entrance halls of the houses, and thus draw into the rooms warm air, eliminating draughts. One of the best methods for effecting this was to have in the hall a gas-steam radiator, which gave an efficiency of 100 per cent. and did not involve a chimney—the products of combustion being infinitesimal, owing to the combustion being so perfect. In the new wounded wards of the St. James' Hospital, 1013 loops have been fitted—half of them having these gas-steam radiators without flues and the other half with flue-pipes; and the sisters were thoroughly satisfied with the results in both cases.

Mr. A. H. Barker said that an efficiency of 45 per cent. for the modern gas-fire was very low. He had seen as much as 78 per cent. claimed; at any rate, a figure of 60 per cent. could be taken as the usual average for modern gas-fires. One gas-fire in his house was bought twelve years ago; and it was as efficient as any of the much belauded and really extremely modern fires. A Committee of the British Association were now engaged in investigating the question of gas-fires and the heating of houses, and some elaborate tests on both gas and coal fires and thermal effects in a room were being carried out at University College. The investigation was an extremely difficult one, because with the gas-fire a great deal of heat was wasted by radiation to the walls, and only a very small proportion of it got back to the air of the room again. It was surprising how little attention had been given hitherto to the ultimate destination of the radiation from heating apparatus. He did not agree with the use of gas-steam radiators or any other gas device which threw the products of combustion into the air of the room, because there was always some sulphur left in the gas. On the whole, the best method for heating a small dwelling was that which he had adopted in his own house. It was to heat the air generally to a slight degree, just sufficient for comfort, by very low-temperature radiation—not more than 110° or 120° and certainly not more than 130° in very cold weather. He had large radiators, which gave plenty of power for this purpose, and, in addition, gas-fires in every room which could be lighted whenever one wished to use any particular room. The cost of fitting up his house, or rather four rooms of it, in the way he had mentioned was only £22, including labour—he admitted that he obtained the apparatus at cost price. The coke-boiler was stoked once in the morning and once in the evening, and gave no trouble. The cost of the gas for the gas-fires varied between 2s. and 3s. per week. This could not be called extravagant, even for a small house.

Mr. A. S. Ackermann confessed to having a gas-fire in his dining room with the chimney completely blocked up; but, in spite of all that had been said of the results of doing this, nobody suffered from headaches, and the canary and cat lived quite comfortably in the atmosphere. The amount of carbon dioxide in the air from a gas-stove dealt with in this way was infinitesmal, looked at as an addition to the large amount normally existing in the human lungs.

Mr. H. H. Creasey (Gas Light and Coke Company) joined with Mr. Dye in objecting to the comparison made in the paper between coal and gas. This comparison took both of these fuels at 100 per cent. efficiency. As a matter of fact, the average coal-fire did not give more than 20 per cent. efficiency; yet the comparison of cost gave gas as costing five times that of coal for continuous heating, which was not the case. It was sufficient to say that the cost of heating by gas was very little more than by coal, especially with the modern efficient radiant type of gas-fire. This was proved by the fact that gas companies were now able to instal gas-fires throughout buildings where several rooms were in use continuously at a cost which compared very favourably with coal at present prices and gas at present prices.

Mr. Hanssen, in reply, said he did not contemplate the proposed modification of the Russian stove would be fitted in small rooms. As a matter of fact, he was not altogether enamoured of it. It had difficulties; and if something better were suggested, he would be quite ready to use it. With regard to the cost of gas, which he had placed at 3s. per 1000 cubic feet, that was the charge for the North Metropolitan area; and although he believed in the South Metropolitan area it had been as low as 1s. 9d., it was up again, and 3s. was about the general average over London. By utilizing power gas, and mixing it with ordinary gas, it should be possible to effect a very great reduction in the price of gas without seriously interfering with its heating value. Gas-steam radiators were very promising, and in some form might be the best way of heating a house. He looked forward to gas at 1s. per 1000 cubic feet which could be used for heating purposes.

GAS-HEATER EFFICIENCIES.

An American Test.

The following results are given in the report submitted by the Committee on Utilization of Gas Fuel Appliances to last month's meeting of the American Gas Institute of a series of tests to determine the relative distribution and quantity of radiant heat emitted by certain types of blue and luminous flame heaters. The test was made in the appliance laboratory of the United Gas Improvement Company, of Philadelphia.

The object of the test was to compare the efficiencies of various types of heaters, considering only the radiant heat. Neither heat of convection nor heat of conduction was measured, nor was any examination made of the quantity and composition of the products of combustion.

The appliances used for the test include heaters of foreign manufacture, as well as those of domestic manufacture.

Number.	Make.	Type.	Radiant Efficiency.		
			Front.	Back.	Total.
1	Domestic	Portable	29·2	17·9	23·5
2	Foreign	,,	35·8	25·9	30·8
3	Domestic	Fireplace	55·7	5·7	30·5
4	Foreign	,,	64·7	12·7	38·7
5	Domestic	Portable	14·7	6·7	10·7
6	,,	,,	41·8	12·6	27·2
7	,,	Fireplace	33·8	23·6	28·7
8	,,	Portable	60·5	19·3	39·9
9	Foreign	Fireplace	67·7	18·5	43·1
10	Domestic	Portable	20·7	21·2	20·9

No. 1 is a domestic-make, portable heater, containing three radiating elements, consisting of semi-cylindrical, vertical, ground glass shells, heated by a blue-flame burner beneath.

No. 2 is a foreign-make, blue-flame, portable heater, containing six radiating elements in the shape of coarse fabric mantles.

No. 3 is a domestic-make, fireplace heater, whose radiating element consists of a refractory slab heated by blast-burners.

No. 4 is a foreign-make, fireplace heater, containing radiating elements consisting of vertical ceramic grids.

No. 5 is a domestic-make, portable, reflector heater, with yellow-flame burners placed near the bottom of the heater.

No. 6 is a domestic-make, portable heater, whose radiating element consists of an asbestos back heated by blue-flame burners under atmospheric pressure.

No. 7 is a domestic-make fireplace heater, whose radiating element consists of two "Vitreosil" cylinders heated by blue-flame burners.

No. 8 is a domestic-make, portable heater, whose radiating elements consist of three vertical, perforated refractory cylinders heated by blue-flame burners.

No. 9 is a foreign-make, fireplace heater, whose radiating element consists of a network of refractory substance heated by blue-flame burners.

No. 10 is a domestic-make, cylindrical, portable heater, whose radiating element consists of a sheet-metal drum heated by yellow-flame burners.

As already intimated, the meeting of the Southern District Association of Gas Engineers and Managers will be held (under the presidency of Mr. W. Doig Gibb) at the Hotel Cecil, at 2.30 on Thursday of this week. After the election of office-bearers for the ensuing year, and the consideration of the reports of the Commercial Section and on the Education of Gas-Fitters, there will be a general discussion on the question of oil-washing and matters arising therefrom. On the termination of the business, afternoon tea will be served.

MIDLAND JUNIOR GAS ASSOCIATION.

The Association have held two business meetings this month. At the first of them, on the 2nd inst., the new President (Mr. G. C. Pearson, of Windsor Street, Birmingham) delivered his Inaugural Address; and at the second, which took place last Saturday, Mr. E. P. Taudevin (of the Richmond Gas-Stove and Meter Company, Limited) gave a lecture on "Town Gas as a Fuel for Furnaces."

REMARKS ON THE PRESIDENT'S ADDRESS.

Mr. Pearson's Presidential Address was dealt with last Tuesday [*ante*, p. 293]; but, unfortunately, at the time of making up the "JOURNAL" for press no account of the other proceedings at the meeting had come to hand. We may therefore now notice some of the remarks made by the speakers—prefacing these by the statement that much of what was said had reference to a suggestion in the address that the rules might be altered to allow of the admission as members of "trading engineers"—*i.e.*, not those engaged solely as salesmen—a proposal which seemed to find very general acceptance among those present.

Mr. F. J. WARD (Knowle), who occupied the chair at the outset, said it had given him a great amount of pleasure to preside over the Association meetings during the last two sessions, though circumstances had made it impossible to carry out all the ideas he had in mind when he commenced his term of office. It was now his duty to ask Mr. Pearson to take the chair. Mr. Pearson had served the Association well for many years, in various offices; and he felt sure that in electing him as President they had chosen a man well fitted for the position.

Mr. G. C. PEARSON (Birmingham), on taking the chair, said his first duty was to propose a very hearty vote of thanks to Mr. Ward for his services to the Association. They owed a good deal to Mr. Ward for consenting to continue in office for a second term, on account of the very unsettled state of things at the beginning of last session. This session the Council had thought fit to arrange a much more comprehensive programme, and were looking forward to what he hoped would prove an interesting and useful series of meetings.

The HON. SECRETARY (Mr. W. J. Pickering) seconded the vote, remarking that it could have been no easy task, during the days of national stress through which Mr. Ward's double term of office had extended, to carry out his duties as President.

The vote was warmly accorded, and duly acknowledged by Mr. WARD.

The HON. SECRETARY said the Council had, at their last meeting, elected Mr. R. G. Marsh (Birmingham) Junior Vice-President, and had co-opted to a seat upon the Council their old friend Mr. W. S. Smart, a former Senior Vice-President.

Mr. R. G. MARSH (Junior Vice-President), in proposing a hearty vote of thanks to Mr. Pearson for his address, said with the remarks on education he was in very hearty agreement. This was an age of specialists; and after young gas engineers had passed their qualifying examinations, more still was required to guide them along on special lines.

Mr. W. S. SMART (Birmingham), who seconded, pointed out that it was just five years since he attended one of their meetings, and he then had to second a vote of thanks to Mr. Pearson for reading a paper. The address was pre-eminently practical and full of interesting points; and they were much indebted to Mr. Pearson for the trouble he had taken in its preparation.

Mr. R. J. ROGERS (Birmingham) remarked that the question of education was a very important one. A higher standard would be demanded in the future; and the time had arrived for laying down a definite line of study in the various branches of the gas industry. In both "Gas Supply" and "Gas Fitting," they had a definite course of study already laid down, and an extensive programme mapped out. In manufacturing and chemical matters they hoped for a definite lead by the Gas Institution. Success in the future would depend on the line of education that was encouraged. He hoped something would be done soon.

Mr. E. W. SMITH (Birmingham) said he would like to thank Mr. Pearson for his address. The Association had had some very good men as Presidents; and he looked forward to the time when Mr. Pearson would occupy a high position in the gas industry. He regarded Mr. Pearson as one of the coming men. As to the subject of education, much had been done already; but much more might be done, as at present the Leeds University was the only one where definitely arranged courses of study adapted to the needs of the gas industry could be taken. The Birmingham University should easily get the necessary support in establishing lectureships and proper classes, in order to afford facilities for a number of students to study the various subjects included in the gas industry curriculum. Some Birmingham firms had already founded scholarships for their own employees, and given time off to a certain limited number of their men to enable them to take higher study courses associated with their particular class of work. One or two engineering firms in the city had adopted this plan, with excellent results. Why should not corporations and gas companies encourage the men in their own departments in a similar manner? They would undoubtedly get a good return for their money. This point had been brought forward many times in the past; but he would like to lay stress on it again, as it was of great importance to the future of the gas industry. Mr. Pearson had suggested that the light oils obtained from continuous verticals would be useful as motor spirit. The same claim had been made for the light oils produced from the low-temperature distillation of coal; but it was overlooked that the percentage of unsaturated oils was high, and the cost of washing such oils might prove to be prohibitive. He listened to the remarks of Mr. Pearson on his vertical installation as "one of the converted." There might come a time when the community would insist on the use of the plant which created the least amount of nuisance. The tendency was also to reduce labour and employ better trained workmen.

Mr. JOHN FOSTER (Birmingham) also emphasized the need for better education, and said the question of the lines of study to be laid down was a very wide one. The various branches had all to be considered—constructional, manufacturing, chemical, and commercial. It was impossible to fully grasp all these subjects; but in whichever phase of the industry they were engaged, they needed to take a sound common-sense point of view. They must be thorough. He knew of young men who had made drawings which could not be worked from. They must strive to become highly proficient in their own particular branch of work. Speaking of the Woodall-Duckham retorts at Windsor Street, he said that there were many points in their favour. At those works, they had to consider the coke market; and their screening plant was designed (at a time when coke was not so easy to sell), to give people the best quality for the various purposes for which it was used.

Mr. W. G. S. CRANMER (Willenhall) said that, on the education question, he was in agreement with what had been remarked. More enterprise was needed, and much more remained to be done, however, if they wished proper progress in the future to be guaranteed.

Mr. T. F. E. RHEAD (Birmingham) emphasized the need in the industry of the happy combination of the theorist and practical man. The educational question he regarded as one calling for the exercise of sound common-sense. The university man was generally a theorist only, and what was urgently needed was a course on the works as part of the university training.

Mr. PEARSON acknowledged the cordial vote of thanks, and referred to some of the points raised in the discussion.

TOWN GAS AS A FUEL FOR FURNACES.

The meeting on Saturday was held at the Birmingham Technical School—Mr. G. C. PEARSON, of Birmingham (the President), in the chair. Among the apologies for absence which were notified by the Hon. Secretary (Mr. W. J. Pickering) was a telegram from Mr. H. M. Thornton, who regretted that indisposition prevented him from being present. The election of six new members was announced, as well as the addition of Mr. E. B. Tomlinson, the Engineer of the Nechells works of the Birmingham Corporation, to the list of honorary members.

Mr. E. P. TAUDEVIN (of the Richmond Gas Stove and Meter Company, Limited) then delivered a lecture, extensively illustrated by lantern slides, on the use of "Town Gas as a Fuel for Furnaces." As was only to be expected in a part of the country that is a hive of industry, the audience found much to interest them in a discourse dealing more or less on general lines with the present and prospective possibilities for gas as a furnace fuel.

Mr. Ralph Halkett's recent paper in Edinburgh [fully reported in the "JOURNAL" for Sept. 5] was early referred to as giving very comprehensive details concerning gas-furnace working, with consumptions which, from Mr. Taudevin's experience, represent a fair average of present-day results. Then giving a calculation himself, the author said that a ton of coal for furnace heating contains, according to quality 24,000,000 B.Th.U., and the wastage due to direct firing and primitive furnace design in many cases amounts to 60 per cent. or more, causing the products of combustion to be dissipated into the air, and also in many cases to heat-up an unnecessary amount of brickwork in direct-fired furnaces, to no useful purpose. In the distillation of a ton of coal for gas making, the 24,000,000 B.Th.U. would produce (say) 12,000 cubic feet of gas of 500 B.Th.U., 6,000,000 B.Th.U.; 12 cwt. of coke (smokeless fuel for regenerative furnaces), 17,400,000 B.Th.U.; also 10 gallons of tar, and 30 gallons of ammoniacal liquor. But however much agreement there may be about the necessity for burning fuel with economy, he thinks that it will require legislation at some future date to give the *coup de grace* to the fuel-wasting furnace and smoky chimney. In his view, one can even imagine that a time will come when large consumers of coal will take on gas making with the idea of using the primary products—that is, the gas, and also the coke for hot producer gas—while for other products a market will be found to recoup them the comparatively heavy capital charge. If large gas-making stations were established near the pit-heads, in the same way as are coking plants, it seems to him that all products resulting from carbonizing could with great advantage be distributed in the industrial areas, while the gas of a high thermal value could be supplied for industrial purposes on a more satisfactory commercial basis.

Some striking information was given with regard to what some of the gas undertakings are doing in the way of coping with the increasing demand for fuel gas. In Sheffield—with the single exception of Birmingham, perhaps the first industrial community to encourage on an extensive scale the use of town gas for the thermo-treatment of steel and other heating operations—the Gas Company have successfully catered for the requirements of their consumers. They had anticipated the value of cheap gas as a

furnace fuel; and their foresight and energetic propaganda have resulted in an extraordinary make of gas for furnace heating. One works alone was cited where the consumption is about 75,000,000 cubic feet per annum. A very large number of furnaces are in use for annealing in the steel works (upwards of 200 being approximately 15 feet in length); while furnaces of smaller dimensions are freely used in about 250 of the Sheffield works. Views were shown of the Company's furnace experimental and demonstration room (available, free of charge, for any Sheffield manufacturer who may desire to carry out practical tests), and of a research laboratory of Messrs. Kayser Ellison, who are now manufacturing high-class steels for the aeroplane and motor industries.

Mr. Taudevin quoted Birmingham as having harnessed-up gas to the extent of something like 2000 million cubic feet per annum, exclusive of engines; gas being freely used for the thermo-treatment of articles manufactured from alloy steels, for brass, Admiralty metal, and aluminium melting, glass melting, annealing, firing porcelain electric insulators, japanning, enamelling, &c. Birmingham, too, he pointed out, possesses a very convenient and well-equipped experimental foundry, exclusively run on gas fuel, as well as an installation of annealing furnaces, both of which are available to intending users of gas. As for other places, Coventry provides a highly interesting example of the utilization of fuel gas on a big scale. No less than 60 per cent. of the gas made is used by manufacturers for industrial purposes; and this surprising figure does not include that employed for motive power. With figures such as these before us, declared the lecturer, there should be no doubt as to the importance of cultivating and extending the use of town gas as a fuel. Indeed, it constitutes the most hopeful outlook of the gas industry. To show what London is doing, a view was thrown on the screen of the Goswell Road furnace demonstration hall of the Gas Light and Coke Company, where every kind of furnace may be seen in operation for annealing, hardening, case-hardening, forging, tempering, metal melting, &c. There are, of course, in the London area many large works using gas-furnaces on an extensive scale. One firm, exclusively engaged on the production of war material, has some 150 gas-furnaces of different types, consuming about 300,000 cubic feet per day.

The next section of the lecture was devoted to a short review of some typical furnaces, and a few particulars regarding their general design and application. After remarking that it would be a mistake to assume that one particular system or type of furnace is suitable for universal application, the lecturer went on to say that the more useful types may be divided into three distinct classes: Natural draught regenerative and reverberatory furnaces, which may be in the great majority of cases used for temperatures up to 800° C. or thereabouts, and in some cases above; furnaces with gas at normal city pressure and fan draught suitable for temperatures between 800° and 1400° C.; and low-pressure gas and air-blast or high-pressure gas, for small furnaces where high working temperatures are required in a restricted furnace chamber. With a natural draught regenerator oven furnace shown, it was declared that temperatures up to about 1300° C. have been obtained.

With the natural draught reverberatory oven furnace, the combustion chamber is the working chamber also. The gas enters the furnace chamber from one side, and preheated air runs along the furnace bottom through fire-clay nostrils; the hot air meeting the burner-mouth at the point where combustion takes place. The flames then pass along the underside of the furnace-roof before entering the flues underneath the floor. This furnace is quite satisfactory for working temperatures up to 1000° C. or more, and very suitable for use where there are no convenient means of using power-driven fans. Owing to the tortuous way the hot products of combustion travel, Mr. Taudevin has stood on the top of one of these furnaces after it had been in operation for six hours on case-hardening work, with a continuous temperature inside the oven of not less than 950° C., and it was possible to hold one's hand over the head of the flue of the furnace—there being practically no waste heat. Recently he visited one of the many works in Birmingham in which this type of furnace has been installed for continuous work—case-hardening and heat-treating very long crank and cam shafts. The carburizing boxes containing several shafts are quite a heavy load; two weighing about 6 cwt. This furnace has been working continuously day and night for four months; and its floor is in perfect condition, and shows no sign of wear, due to the fact that there is no local heating. The head of the firm stated that the gas consumption was most reasonable, and below the makers' specification.

The low-pressure gas and air ["L.P.G.A."] system, patented about three-and-a-half years ago, was then described. In these furnaces means have been adopted to heat the whole of the air supply necessary for combustion (which takes place in the furnace-chamber) in such a way as to render it unnecessary to employ the usual bunsen burners with their secondary air supply. Combustion of the mixture of gas and air is so near perfection that no excess of air is required, and therefore no heat is dissipated by the carrying-off of this excess air at a high temperature. The arrangement results in very economical working; the only heat losses being those necessarily incurred by slight radiation from the outside of the furnace and from the flues, in which the temperature is only that required to carry off the products of combustion. A reducing atmosphere may be maintained under the most economical conditions by simply diminishing the pressure at the air-main; the air being usually supplied by a fan. By the use of valves or cocks upon the main gas and air supply pipes, the furnace may be regulated for temperatures to a very fine degree. It is desirable (particularly where a non-oxidizing atmosphere is required) to work the furnace with a slight pressure inside it—*i.e.*, a small amount of flame should come out of the peep-holes in the door, when these are opened—which, of course, will prevent the indrawing of air through the doors. Each flue is efficiently controlled by double dampers; and emphasis was laid on the point that, in order to obtain the best results in this or any other furnace, the flue regulation must be looked to when altering the rate of combustion. The highest temperatures are readily obtainable; and there is a complete absence of the noise usually prevalent with gas and air blast furnaces, and of cutting heats which destroy brickwork and tiles.

From the point of view of economy in consumption, the members were told that steel has recently been annealed in a "L.P.G.A." furnace, capable of taking 8 or 9 tons, with a consumption of 3000 cubic feet of gas per ton, when 6 tons were being treated per charge, and the re-heating of billets for rolling at the rate of 3500 feet per ton—the material being heated to over 1100° C. This furnace, by reason of the non-oxidizing atmosphere available, has been recommended by several of the leading Sheffield steel firms for the heat treatment of forgings made from nickel-chrome steel and other high-class alloys. Mr. Taudevin's opinion is that the reverberatory oven furnace will be found to be the most satisfactory town-gas furnace for carburizing, and the "L.P.G.A." for the subsequent re-heating and hardening operations. The latter furnace is, he said, practically perfect for this work, as surface decarburization may be altogether avoided by reason of the soft nature of the flame in the furnace-chamber.

Some attention was next devoted to gas and air blast furnaces—a type which, it was pointed out, is more or less restricted to the tool-room, for the production of all kinds of milling cutters and lathe and boring tools. The two temperatures desired for the heat treatment of milling cutters are generally secured by the use of a twin-chamber furnace; and in referring to this matter, the lecturer mentioned that too much stress cannot be laid on the importance of having a high-temperature furnace-chamber free from air. The consumption of gas in these small furnaces is relatively high; but this is really of no economical importance, as the high-speed cutters being treated are generally of considerable value. The important points are to have temperatures dead-even and of a neutral nature. A twin high-speed furnace having chamber areas 15 in. by 12 in. will consume something like 500 cubic feet of gas per hour to maintain a temperature of 1300° C. in the lower chamber and (say) 900° C. in the upper chamber.

The concluding portion of the lecture consisted of an excellent series of slides (with descriptive remarks by Mr. Taudevin) illustrating gas furnaces used in the production of war materials.

DISCUSSION.

Mr. LANTSBERRY (Birmingham), speaking from the point of view of a gas consumer, expressed the opinion that much good would come of meetings between gas makers, gas users, and furnace manufacturers, to discuss difficulties and how they could be overcome. There could not be the slightest doubt that gas-furnaces had been a great boon in the treatment of metals. Uniformity of temperature was absolutely required in the heat treatment of metals. When he told them that some of the modern alloy steels could, by the simple process of heat treatment, have their mechanical properties trebled in value, they would understand how important a proper design of furnace was. A difference of 100° would mean all the difference between complete failure and complete success. He did not go quite so far as Mr. Brayshaw, of Manchester, who some years ago read a paper before the Institution of Mechanical Engineers, in which he stated that a difference of 5° C. in hardening certain tool steels made all the difference between success and failure; but there was no doubt that a difference of 5° in the temperature of hardening some of the modern steels would make all the difference between very ordinary results and very good results indeed. Another point of great importance was uniformity of temperature throughout the furnace; and this he thought the designers of gas furnaces had not taken sufficiently into account. Even with the best gas-furnaces, it was very difficult to secure absolute uniformity. At the back and the front there was a cold zone. He did not think the difficulty insuperable; but, to his mind, until it was overcome it was desirable that gas-furnace makers should point out to users the existence of these two zones, and persuade the user to get a furnace longer than the size he actually desired. He quite agreed that there was no limit to the use of gas.

Mr. W. H. JOHNS (West Bromwich), in proposing a vote of thanks to Mr. Taudevin for his lecture, said that brass melting was growing at the present time in West Bromwich very rapidly; and in the last few months there had been installed no less than twenty brass-melting furnaces for 100-lb. pots. It was a very good idea that, as suggested, all the parties should be brought together. A manufacturer often did not know what it was he really required; and expert advice was very desirable. The standardization of the gas which was receiving the attention of the industry at large should save manufacturers a lot of trouble in designing and supplying furnaces to suit different qualities of gas in different districts. By means of low-pressure gas and an air-blast, one could overcome many little difficulties; but there was one disadvantage, and it was an important one. In a small works, it necessitated the provision of some mechanical means of obtaining the blast; and

the running cost weighed sometimes against manufacturers adopting it. With the temperature required in furnaces for certain work, he had found that the lifetime of the brickwork was very short; and some means of removing and quickly rebuilding the bottom lining tiles was desirable. He had in mind quite a home-made furnace the whole of which could be demolished in half-an-hour, and built up again in an hour. Manufacturers should give their attention to a furnace which could be easily repaired at very little cost. Had Mr. Taudevin found any difficulty with regard to the life of his burners? He had seen a home-made arrangement for keeping the burner-heads water-cooled, which lengthened the life of the burner.

Mr. B. SKIDMORE (Smethwick), in seconding the vote, said they were all more or less at the present time interested in gas-furnaces; and no doubt to a great extent users were in the hands of the manufacturers. A great many consumers were alive to their requirements, but were not in a position to exactly define the apparatus that would be most suitable for them. Therefore it would be well if meetings between all parties concerned could be arranged for discussing matters. Smethwick, like every other manufacturing town, had benefited to a great extent by the increased consumption in this direction, which had about compensated for the losses in other ways. They had in some cases an increased consumption to the tune of about 20 million feet per annum; and this showed that there was a great field for the introduction and retention of the apparatus. It was, however, necessary that the best appliances should be placed in the hands of consumers; and they were all indebted to the makers of the various types of furnaces for the thoroughness with which they had entered into the work of meeting requirements.

The PRESIDENT, supporting the vote, remarked that there was no doubt as to the great developments that had taken place of recent years in the use of town gas for industrial purposes. The amount of gas consumed in this way was a very big proportion of the total sales. As a matter of fact, the quantity of gas used for heating had caused to be re-considered altogether the question of the kind of gas suitable for town supply. The lecturer said that in Birmingham they sent out something like 2000 million cubic feet of gas a year for industrial purposes, excluding engines. This figure was probably on the small side. At least 25 per cent. of the total sales was used for industrial heating, and for all industrial purposes 40 per cent. was consumed. Speaking from the point of view of the man who had to produce the gas, the fact of such a large quantity being so used had undoubtedly tended towards economy in manufacture, as anything that had the effect of equalizing the load all the year round was much to the benefit of the works.

Mr. TAUDEVIN, acknowledging the vote of thanks, expressed his pleasure at lecturing before the Association. Mr. Lantsberry had referred to the cold ends of a furnace. It was rather difficult to obviate this; but endeavours were being made to do so. If the furnace-door was opened frequently, one was bound to get a cold mouth; but in a long operation during which the furnace was practically sealed, it was possible to have a temperature equal within 5° or 6° C. over the whole of the furnace. Furnace makers would welcome any suggestion that would help to do away with cold ends. In answer to Mr. Harold Jones, of Stourbridge, he said that the firm had found an enormous advantage in the system of intensifying combustion with pre-heated air. With two furnaces, they found an advantage of 300° C. in the regenerative type, with the same consumption of gas. He had been interested in Mr. Johns's remarks about water-cooled high-pressure burner-heads, which sounded quite a good thing. His firm had a burner of the injector type taken into the furnace-wall, in which, instead of depending altogether on forced draught for getting the mixture, a series of air-inlets round the head provided for induced draught. This had the advantage of cooling the burner-head and assisting in getting a proper mixture of gas and air for combustion. With this new burner, he might say, they had entirely eliminated the trouble that had been experienced before of getting the head of the burner destroyed.

Metal-Working Gas-Furnaces.

Some details are given in the current "Journal des Usines à Gas" of gas-furnaces just installed for metal working by the Paris firm of Van Nuxem and Bonnasseau. Four furnaces, consisting of Mèker burners, have been fitted in substitution of two burning tar oil. One of the new furnaces is for use in tempering tools; the other three (more correctly described as gas-forges) are for the heating of steel bars, in drawing out the ends to a length varying with the diameter, in order to form a species of tongue and thus facilitate the further drawing of the bars. The latter range in diameter from ¾ inch to 4¾ inches and in length from 10 to 20 feet. They are supported on arms, and heated to redness over a length of from 12 to 16 inches. The end-portion, of 8 to 12 inches in length, is then thinned by power-driven rams. The burners are supplied with a mixture of gas and compressed air; each furnace consuming 350 to 420 cubic feet per hour. The combustion of the gaseous mixture takes place against an inclined wall, immediately over the furnace-hearth; and it thus envelopes the whole of the latter in a sheet of flame, into which the bars are thrust. It is found that about 11,000 cubic feet of gas suffice for the heating of some 50 tons of the steel bars; and the results have proved entirely satisfactory.

REFRACTORY MATERIALS.

Discussion at the Meeting of the Faraday Society.

The Faraday Society held a general discussion on refractories at their first autumn meeting on Wednesday last. Sir ROBERT HADFIELD, F.R.S., the President of the Society, was in the chair and the detail with which the whole subject was thrashed out from all points of view will be gathered when it is stated that 4½ hours were devoted to the papers and discussions. While much that was said related more specifically to the iron and steel industries, nevertheless, there was strict reference to the question of refractory materials for use in the gas industry.

The PRESIDENT, in his opening remarks, dealt solely with the iron and steel industries; and he pointed out how little attention had been given to the question of refractories, having regard to the vital importance of them to the iron and steel industries of the country. He called attention to the previous work on the subject, and reproduced sections of the standard specification of the Joint Refractory Materials Committee of the Institution of Gas Engineers and the Society of British Gas Industries.

IMPORTANCE OF UNIFORMITY IN TEXTURE.

Dr. J. W. MELLOR, who gave a general review of the whole subject from the point of view of the texture of fire-bricks, said that the contraction test of the gas engineer's specification was an attempt to deal with the after-contraction of fire-bricks, and it served a useful purpose in emphasizing the importance of adequate burning. As soon as the fire-brick manufacturers realized what the consumer wanted, they soon gained control of the difficulty, and the after-contraction of commercial samples was reduced from about 1 to about ½ per cent. in a comparatively short time. It was probable that many more difficulties would soon be solved if the consumer would give the manufacturer a clear idea of what was wanted. In the early days of the application of the gas engineers' specification, manufacturers of fire-bricks with a large after-contraction sometimes mixed the materials with enough siliceous material to make the brick give a good result with the contraction test even with unfired bricks. In some cases the two opposing changes were perfectly balanced, and the resultant change in volume was zero. Naturally, this method of satisfying the test was condemned as a cheat; but he saw no particular harm in the addition for many purposes, provided the composite brick be well fired, the added silica be coarse-grained, and the binding clay suitable. The question of the size of grain, the action of grog in fire-bricks, and the controversy as to machine *v.* hand-made fire-bricks was gone into in some detail, and Dr. Mellor concluded with emphasizing the importance of uniformity in texture, be it coarse or fine. At the same time he expressed the opinion that a fine grain texture, other things being equal, gives fire-bricks the property of resisting abrasion and attack of fluxes, slags, flue dust, salt vapours, &c. The main point was that the texture of a fire-brick is virtually as important as its refractoriness and chemical composition.

SCIENTIFIC WORKERS AND PRACTICAL EXPERIENCE.

Professor W. G. FEARNSIDES said that one of the most pressing necessities in refractory material manufacture at the present time is for scientific workers to go through the works, both of the makers and of the users of these materials, and gather information from the works' foremen, many of whom had considerably more knowledge on the subject than the scientists. In addition, he urged co-operation between the laboratories and the works, in order the more easily to overcome the many problems still waiting to be solved. He favoured a greater application of microscopic methods to the study of refractory materials on the lines of the pioneer work done for fifty years by the late Henry Clifton Sorby, of Sheffield, who, in his early work on the physical constitution, firs of rocks and afterwards of metals, rubbed-down preparations from silica brick and fire-bricks, to a condition of fair transparency; and in determining the texture of any brick the thin slice method is one of direct and easy application.

SOME INTERESTING TESTS OF MATERIAL BY DR. LESSING.

Dr. R. LESSING showed a series of specimens illustrating a method of testing he devised five or six years ago for ascertaining the texture and rational composition of refractory mixtures before firing. It consists of a simple process of elutriation, by which the true clay substance of the "green" clay is removed by a gentle current of water, and separated from the water by allowing it to settle out on standing. The rate of flow of water is so adjusted that the "grog"—*i.e.*, the previously-fired portion of coarse particles, which eventually forms the rigid skeleton of the fire-brick—and also the heavy and coarse grain residue of the green clay, consisting of sand, shale, or carbonaceous substances, are left behind in the elutriating vessel. Elutriation is continued until the last clouds of clay substance are removed, and the water becomes perfectly clear, with the lightest portions of the residue floating just below the outlet. A very simple form of elutriator (accurate enough for works purposes) consists of a tall glass cylinder into which the water is passed through a glass tube reaching nearly to the bottom. The cylinder is placed in a bucket into which the clay suspension overflows, and to which the clear water is syphoned off after settling. For the purpose of the test, about 500 grammes of the

sample—which may be taken before or after "tempering" or from a moulded body before or after drying—are well soaked in water and washed into the cylinder. The resultant products of clay and residue are dried, and a grading test is then performed on the residue from which the texture of the body and the ratio of grog, granular clay, shale, and coal can be ascertained. The specimens exhibited were products obtained in Dr. Lessing's test from retort and fire-brick mixtures from the Stourbridge and Glenboig districts, as made before and after the adoption of the standard specification. They clearly showed that before the standard specification was adopted mixtures for gas-retorts contained very little grog, which had, moreover, suffered largely from excessive crushing, yielding dust, while the green clay, serving as binder, had largely remained in the form of coarse granules instead of being reduced to fine powder. The change in manufacturing methods by which the grog is crushed and graded separately and the powdered green clay mixed with it, were shown by specimens taken after the adoption of the standard specification. For comparison, a sample of a German retort mixture was shown, which was remarkable for its large proportion and size of grog—viz., 66 per cent., as against about 35 per cent. total grog in English retorts. Out of the 66 per cent. of grog, 21·4 per cent. was larger than ½ inch and 38·4 per cent. larger than ¼ inch. This exceptional size might not be representative of all German retorts—in fact, it was somewhat different from that of the retorts which, for instance, the South Metropolitan Gas Company used to import from Germany. The mixture was also noticeable for the total absence of clay residue, shale, or coal—indicating that the binding clay had undergone some preliminary purification. The test has been used successfully for the daily control of manufacturing operations, and was recommended by the author for this purpose, and, in the absence of a reliable quantitative method for ascertaining the textures and rational composition of refractories, was a simple and useful guide.

Dr. Colman on the Work of the Joint Refractory Materials Committee.

Dr. Harold G. Colman said he had been asked to contribute to the discussion an account of the work of the Joint Refractory Materials Committee of the Institution of Gas Engineers and the Society of British Gas Industries during the past few years. For many years past, owing to the higher working temperatures employed in gas-works retort-settings, increasing difficulty had been experienced in obtaining fire-resisting materials of fully reliable quality for such temperatures; and, following the reading and discussion of the valuable paper on "Refractory Materials" by Mr. F. J. Bywater at the annual meeting of the Institution of Gas Engineers in 1908, a Joint Committee was formed, consisting of members nominated by the former Institution on behalf of the users, and by the Society of British Gas Industries on behalf of the manufacturers of such materials. Mr. Bywater was appointed Hon. Secretary, and Dr. J. W. Mellor accepted the position of Technical Adviser; and on these two has fallen the lion's share of the work. The main work of the Committee had been: (1) The drawing-up of a standard specification for the various classes of material commonly employed in gas-works, and the prescription of the various tests with which such goods should comply for these purposes; and (2) the carrying out, so far as means allowed, of research work on matters likely to yield information of value to both manufacturers and users, and to help towards the main end for which the Committee was formed—namely, the provision of the refractory goods of the most suitable qualities for the particular purpose required.

The matter of the standard specification was dealt with first; and to assist in drawing it up, a number of typical gas-works were selected. Investigations were made at these works to determine as exactly as practicable the maximum temperatures attained in the various parts of the furnace plant, and the extent and rate of the temperature fluctuations which occur. Simultaneously, tests for refractoriness, permanent expansion and contraction, porosity, &c., were carried out on a large number of samples of the material at that time obtainable from the different manufacturers. In laying down the conditions of the specification, the Committee recognized from the outset that it was impossible to ask for tests of such stringency as would be required for an ideal material, but that at the commencement the tests must be such as could be complied with under the existing conditions of manufacture. The tests prescribed were, therefore, such as it had been found from the above investigation would be complied with by the better-class material then available, but which would rule-out the less satisfactory material. The intention was to revise the specification periodically, as the technique of fire-brick manufacture advanced in the direction of greater stringency, and to modify the prescriptions given for making the various tests for the material as increased knowledge on the point allowed this to be done with advantage. Except in one small point, no stipulations were made in the specification as to the methods of manufacture; this being left free to the manufacturers themselves—subject, of course, to the products made complying with the prescribed tests.

In the specification, three different classes of material were dealt with—viz., retort material; ordinary fire-bricks or blocks, the silica content of which was less than 80 per cent., and in most cases less than 75 per cent.; and silica-bricks—these being divided further into the true silica-bricks containing 92 per cent. or more of silica, and those containing only 80 to 82 per cent. of silica, termed for distinction "siliceous-bricks."

Retort material presented exceptional difficulties, owing to the great and rapid temperature fluctuations to which it was subjected, due to the retorts being filled at frequent intervals with a large mass of cold coal when at a temperature of 1000° C. or higher. To withstand this rapid change of temperature, an open porous structure was required, in addition to refractoriness, and freedom from excessive permanent contraction or expansion, &c. In this case, a minimum degree of porosity was also specified. With this material also occurred the only case in which methods of manuture were mentioned; the prescription being made that the fine dust should be removed from the grog used in the manufacture of the retorts. With retort material, difficulties in respect of lack of refractoriness had not been very frequent, but much greater difficulties arose from lack of mechanical strength of the retorts, resulting in fractures of the retorts in transit and in course of erection, and subsequent development of cracks under the strains set up in the hot furnace and the rapid alterations of temperature due to their periodic charging with cold coal. There was much room for improvement in manufacture to obviate these defects.

In the case of ordinary fire-brick material, specifications were given for the two grades of material, for use in different portions of the retort-settings according to the maximum temperature they were required to withstand. Since the publication of the specification, tests made of the material supplied by manufacturers had shown that in the greater part of the material available a steady improvement had taken place in the refractoriness; and the amount of permanent expansion or contraction shown on test by the goods and the specified tests in these respects could be considerably stiffened without materially reducing the amount of material which would be available. The question of the extent to which any such stiffening-up of the tests should be made was bound-up with the further question of the exact conditions under which such tests were to be made, the investigation of which point was not complete; and on this account no alteration in the allowable limits had yet been made.

With respect to siliceous bricks—*i.e.*, bricks containing 80 to 90 per cent. of silica—matters had moved rapidly since the specification was drawn up, very considerable developments in this class of brick having taken place both in this country and in the United States; and the whole section required reconsideration.

The second object of the Committee—namely, the carrying on of research work in the subject—had been proceeded with throughout the last few years, so far as the means at the disposal of the Committee had allowed. The limited funds available, and the fact that they had themselves no properly-equipped laboratory at their command, had, however, precluded their undertaking such work to the extent they would have desired; and that they had been able to proceed in this direction as far as they had, had been largely due to the co-operation and help of the Stoke-on-Trent Committee and of Dr. Mellor, at the County Pottery Laboratory at Stoke. Their funds had now been increased owing to a grant from the Privy Council Committee on Scientific and Industrial Research. Even with this contribution, however, the available funds only amounted to £230 per annum at present—a sum which was quite insufficient to carry out research work to the extent required, even so far as the special uses of refractory materials for gas-works and coke-ovens were concerned, and quite apart from the wider considerations of the metallurgical and other industries concerned in the matter. For the full investigation that the subject urgently required, a much larger sum was necessary, together with the co-operation of all classes of manufacturers and users of refractory goods. So far as he was able to speak for the Committee, he thought he might promise their hearty co-operation with efforts of others in the same direction. The chief matter on which research had been in progress recently had been that of the influence of pressure on the refractoriness of a fire-brick—this being a matter of great importance both from the manufacturing point of view and on the question of the prescribed tests. Generally, the material in a setting was under considerable pressure, and in contact with a reducing atmosphere. The tests prescribed in the specification were, however, carried out under no pressure, and in an oxidizing atmosphere; and as pressure and reducing atmosphere both tended to lower the refractoriness, the tests specified were not carried out under conditions corresponding to those existing in actual work, but under too favourable conditions. When the specification was drawn up, however, while this was recognized, no method of test had then been devised for carrying out the tests under load or in a reducing atmosphere, which could give reliable results; and until such time as suitable tests under these conditions could be devised, the method of testing without load and in an oxydizing atmosphere was specified. To compensate approximately for these conditions being more favourable than those existing in practice, a minimum degree of refractoriness was specified considerably higher than would have been fixed had it been possible to prescribe a suitable test more nearly representative of the working conditions.

The investigation of the effect of load on refractoriness had since been commenced by Dr. Mellor, using in the first place fire-clays of various origin; and the results of the work had been published by Dr. Mellor and Lieut. Moore in the "Transactions of the English Ceramic Society," in which they showed from the results obtained in the investigation of these clays the adverse effect of pressure on refractoriness. The extent of this could be represented fairly closely by an empirical formula. The investigation was now in progress with a much larger apparatus capable of testing a full-sized brick; and special bricks were being manufac-

tured from different clays with different percentages of grog, and fired at known temperatures, as it had been found absolutely necessary that the "life-history" of the brick must be known, which was not possible with bricks obtained in the open market. This necessity, however, involved increased cost and time in carrying out the research. Other investigations were in progress or under consideration on the following points:

1.—Determination of the differences in size of bricks when cold and when at high temperature—*i.e.*, the combined effect of the thermal expansion and the "permanent" expansion and contraction.
2.—The cement material employed in retort-settings and the influence of the addition thereto of varying proportions of fine grog.
3.—The relative effect of an oxidizing atmosphere and a reducing atmosphere on the refractoriness and permanent expansion or contraction of refractory goods.
4.—The influence of fine flue dust carried into settings on the refractoriness and life of the materials employed.
5.—The effect of the admixture of highly siliceous rock (such as ganister) on the working qualities of fire-clay goods.
6.—The effect of firing temperature on the subsequent refractory qualities of the goods.

The necessary apparatus for the investigation of several of these matters had been designed by Dr. Mellor, ordered, and in part delivered to the County Pottery Laboratory at Stoke; but the rate of progress which would be made depended largely upon the numbers of workers who could be engaged upon the work.

Refractory Materials in the British Empire.

Mr. Crook, of the Imperial Institute, gave some interesting particulars of the enormous quantities of refractory materials available in various parts of the British Empire—naming Ceylon, India, and South Africa in respect of deposits of graphite, monazite, bauxite, and zirconia. With regard to zirconia, some years ago the Institute had endeavoured to market colonial supplies of the material; but they failed to do so, as there seemed to be no request for it.

A Manufacturer's Views.

Mr. Albert Cliff, speaking from a maker's point of view, said a good deal of controversy had in recent years gathered round the making of retorts used for the manufacture of town gas. Although the controversy was now a matter of history, a few general remarks on the subject might perhaps be useful. One of the best means of effecting the elimination of expansion and contraction, and incidentally effecting economy, would be secured by the return to the factory of old material which had done service over a period of years at varying temperatures. The material was no worse for discoloration by carbon, which would burn off on re-manufacture. Partially fused or slagged pieces should be kept out. Although there was a difference of opinion among gas engineers as to which was the better, hand-made or machine-made retorts, it should be put on record that this country pioneered the manufacture of retorts by machinery. Work of very great urgency awaited both the chemist and the craft in making an organized investigation into the commercial value of chromite, magnesite, graphite, and other materials reported as abundant in the Colonies. He believed the makers of refractory materials were alive to their responsibilities, and were preparing to be equal to all demands; but the growth of knowledge in this branch of industry had been painfully slow.

Zirconia—the Newest Refractory Material.

Dr. W. Rosenhain, of the National Physical Laboratory, made some interesting remarks with regard to zirconia, the newest of refractory materials, and mentioned experiments at the National Physical Laboratory in the direction of purifying material of this nature from America. For the present, however, the chief application of this work will be in the optical glass trade.

Dr. Hadfield supported Professor Fearnside's view that what was wanted was for the scientific workers and the makers and users to come into association in this matter.

Dr. Boswell made the interesting statement that there were abundant supplies of silica in this country.

The Work of Professor Cobb.

Professor T. Turner, of the Birmingham University, referred to the work of Professor Cobb, especially in connection with the internal actions going on in fire-bricks which resulted in chemical changes. He specially mentioned a paper read by Professor Cobb before the Society of Chemical Industry a few years ago.

Investigations at the Imperial College of Science.

Dr. W. C. Hancock said that by the kindness of the Iron and Steel Institute and the Management of the Carnegie Trust, he had been placed in charge, under Professor Bone, at the Royal Imperial College of Science, of an investigation upon refractory materials. The plan adopted had been to endeavour, as far as possible, not to start purely scientific investigation of many theoretical points, but to get into close touch with builders and see exactly what their requirements were.

Two representatives of the Ministry of Munitions—Mr. W. J. Jones and Mr. M'D. Duckham—who took part in the discussion urged the need for co-operation between the laboratories and the works if the development of refractory materials in this country was to give the results that were being aimed at—a suggestion echoed by several later speakers.

The President, at the close of the meeting, suggested that the subject should be discussed at various centres throughout the country.

From the size of the attendance, and the fact that the interest was sustained until 11.30 p.m., and could have been maintained to a still later hour, it is evident that the importance of developing the refractory materials industry in this country is now thoroughly appreciated. Not the least remarkable fact brought out by various speakers was that, notwithstanding there are supplies of raw materials at hand in various parts of Great Britian and in the Colonies, many of the fire-bricks used in this country before the war were imported from abroad. Now that the interests of users, makers, scientists, and the Geological Survey have been aroused in no unmistakable manner, and having regard to the research work that has already been put in hand with the assistance of Government grants, it is unlikely that the old position will ever again be reverted to. The very large exhibit of British made refractory materials on view at the meeting was ample evidence that it is only necessary to set to work to accomplish all that is hoped for.

AMERICA AND TOLUOL PRODUCTION.

A joint meeting of the American Chemical Society and the Electrochemical Society has recently been held under the presidency of Dr. Herty, who, in the course of his address, recommended that provision should be made in the immediate future for the storage of large quantities of Government-owned toluol.

Mr. Horace K. Porter read a paper at one of the meetings on "Coal and Coke Bye-Products as a Source of Fixed Nitrogen," in which he gave the assurance that the United States would not be in danger of a nitrogen famine in case of war, such as Germany faced when she was cut off from outside sources. He said that the available supply of fixed nitrogen from the coal in the United States was adequate to meet the nation's military needs in any reasonable contingency. A compilation made by him showed that up to September last there were the following plants and bye-product ovens in the States:

	No of Ovens.	Annual Capacity in Net Tons (2000 lbs.). Coal.	Coke.	Ammonia NH_3.
Plants building .	2236	13,867,000	10,126,600	37,810
,, completed .	6756	29,827,000	22,479,400	75,950
Total	8992	43,694,000	32,606,000	113,760

	Net Tons.
Annual capacity for ammonia at coke plants	113,760
,, ,, ,, ,, at gas-works.	12,500
Total annual capacity of coal carbonizing plants . . .	126,260
Practical yield of 95 per cent. nitric acid from this amount of ammonia	404,000
Total consumption of ammonia in United States in 1915.	70,000
Ammonia capacity, at the close of 1917, in excess of that necessary to make 180,000 tons of 95 per cent. nitric acid	70,100

AMERICAN GAS INSTITUTE CARBONIZATION COMMITTEE.

Report Submitted at the Annual Meeting.

The following report of the Committee on Carbonization (written by Mr. C. W. Hunter, the Chairman) was presented at the eleventh annual meeting of the American Gas Institute.

Section I.

The last decade has seen the development of many new ideas in the design of carbonizing plants; and for the past few years the Carbonization Committee have devoted considerable time and space to descriptions of bench design and methods of operation, especially of the newer types. As a number of new installations have been made during this period, many of which embody more or less radical changes from previous designs, it was decided that an effort ought to be made to obtain figures showing the operating results of as many as possible of the more recent horizontal, inclined, and vertical retort plants, and bye-product ovens.

The Committee fully realized the difficulty of collecting accurate information of this kind, and the danger of misinterpretations of the figures if used for direct comparison between plants, without taking into consideration the conditions surrounding each one. It was hoped, however, that sufficient information could be given regarding the coal used by the different companies, methods of operation and of testing, &c., so that the figures would be of interest to a practical operator.

A letter was therefore sent to a number of the gas companies east of the Mississippi, which operated carbonizing plants, in which was included a list of the points to be covered, asking for the operating results covering a period of at least one year. Out of 28 coal-gas companies, three had declined to give results. The others, representing 28 separate installations, responded in a gratifying manner. Of the bye-product oven companies, only two

TABLE I.—*Statistics of Carbonizing Results.*

All figures represent twelve months' operations, and are based on coal as charged per ton (2000 lbs.) unless otherwise noted.

Plant No.	Description of Benches. Size.	Retort Dimensions.	Length of Retort.	Type of Retort.	Retort and Setting.	Date of Installation.	Capacity Tons Coal per Day.	Operating Temperatures. Combustion Chamber. Aver.	Combustion Chamber. Max.	Around Retort. Aver.	Around Retort. Max.	Outlet Recup. Aver.
	HORIZONTALS.											
H-1	20 benches-8's	—	22 ft.	Through	Silica	10-1913 10-1914	350	—	2600	2200	2260	800
H-2	15 benches-8's	—	22 ft.	Through	10 clay 5 sil.	10-1913 5-1915	280	2200	2600	—	—	800
	INCLINES.											
I-1	6 benches-9's	—	20 ft.	Inclined	Clay	—	137	2550	2800	2300	—	1050
I-2	5 benches-9's	—	20 ft.	Inclined	Clay	1907	95	—	—	—	—	—
	VERTICALS.											
V-1	8 benches-4's	8 in. by 3 ft. 10½ in. at top	25 ft.	Continuous	Silica	1914-15	175	2450	—	2250	—	1350
V-2	4 benches-4's	7 in. by 3 ft. 10½ in. at top	25 ft.	Continuous	Silica	1914	82	—	—	2350	—	1200
	COKE OVENS.											
O-1	Typical plant—15 ton recuperative			—	Silica	—	21 per oven	—	—	2200	2450	660
O-2	53-13'5 ton regenerative ovens			—	Silica	1913-14	950-18 hours	—	—	2300	2400	500

Plant No.	Gas—Corrected for Bar. Temp. and Press. Candle Power. Aver.	Burner.	Standard.	B.Th.U. Aver.	Coal. Aver. Weight of Charge.	Hrs. Carb. Period.	Coke. Per Cent. Coal Carb.	Per Cent. Breeze.	Tar*. Gal. per Ton Coal Carb.	NH_3 Pounds per Ton Coal Carb.	Bench Fuel. Pounds Fuel per 100 lbs. Coal Carb.	Retort-House Labour in Hours per 24-Hour Day.
H-1	16'7	Met. No. 2	Hefner	605	1283	7	65 (3)	11'5	11'0	4'9	12'8	289
H-2	16'6	Met. No. 2	Hefner	616	1400	7	68 (2 and 3)	12	12'7	5'4	11'8	220
I-1	14'8	Sugg F	Pentane	—	1300	6	67 (2 and 3)	16'5	11'7	4'9	9'5	120
I-2	15'8	Sugg D	Elliott and candles	—	950	5	70 (2)	15	14'8	4'4	15'0	87
V-1	15'8	Sugg D	Pentane	—	—	—	69 (1)	16	—	—	—	160
V-2	17'4	Sugg D	Pentane	—	—	—	70 (2)	13	15'0	4 8	14'0	74
O-1	11'2	Flat flame	Pentane	542	30000	17-20°	76	4	8'3	5'9	40 p.c.	—
O-2	14'9	Sugg D	Pentane	605	27000	21	70	5	6'0	4'8	50 p.c.	389

* Original figures corrected to include 2 per cent. water. (1) Total coke determined from actual daily operating weights. (2) Total coke determined from yearly figures of coal carbonized and coke sold and used. (3) Total coke determined from occasional tests.

TABLE II.—*Statistics of Coke Handling Systems.*

Plant No.	Type of Plant.	Production. Coke Production, Tons per Day.	Breeze per Cent. of Total Coke.	Coke Disposal. Per Cent. of Production Sold as Coke.	Per Cent. of Production Sold as Breeze	Per Cent. Used at Works. Water Gas.	Producers.	Misc.	Description of Market. Domestic per Cent.	Industrial per Cent.	Coke Handling. Method of Quenching.	Method of Conveying from Settings to Screens.
	HORIZONTALS.											
H-1	Through	218	11'5	51'0	0'1	23'0	14'7	11'2	97'0	3'0	M'Donald-Mann shoots	Indust. railway, plat. elevator
H-2	Through	190	12'0	69'5	1'8	1'0	17'4	10'3	98'0	2'0	D. B. conv. and spray pipes	De Brouwer and belt conveyors
H-4	Through	87	15'0	42'5	..	20'0	28'2	9'3	..	..	Conveyor	Scraper conveyor
H-5	Through	215	16'6	60'0	0'2	11'5	11'9	16'4	99'0	1'0	M'Donald-Mann shoots	Indust. railway, belt conveyor
H-6	Through	196	15'0	65'4	..	0	19'6	15'0	100	0	D. B. conveyor and spray pipes	De Brouwer conveyor
H-8	Stop end	123	8'0	0	0	77'0	23'0	0	0	0	Not quenched	
H-9	Stop end	55	8'6	72'0	0'1	5'0	20'0	2'9	100	0	Spray	Indust. cars, plat. elevator
H-10	Stop end	45	15'5	..	..	..	..	..	100	0	Hand	Wheelbarrows, plat. elevator
H-11	Stop end	35	14'9	83'5	0'5	0	0	16'0	100	0	M'Donald-Mann shoots	Indust. cars, plat. elevator
H-12	Stop end	16	7'2	81'1	2'0	2'5	10'0	4'4	100	0	Hand	Wheelbarrows, plat. elevator
H-13	Through	76	10'0	90'0	10'0	0	0	0	80'0	20'0	M'Donald-Mann shoots	Indust. buggies, plat. elevator
HV-1	Through hor. & cont. vert.	129	16'0	43'0	16'0	16'0	25'0	0	50	50'0	H-hand; V-discharged cold	H- telpher; V- peck carrier
	INCLINES.											
I-1 & 5		425	16'5	44'5	7'0	24'5	14'1	9'9	50	50	D. B. conv. and sprays	De Brouwer conv. indust. cars, plat. elev.
I-2		61	15'0	19'0	5'0	50'0	20'0	6'0	100	0	D. B. conv. and sprays	De Brouwer conveyor, loco. crane
I-3		39	15'0	32'7	0	27'2	21'3	19'8	100	0	D. B. conv. and sprays	De Brouwer bucket hoist
I-4		121	6'0	47'3	..	21'0	25'7	6'0	100	0	D. B. conv. and sprays	D. B. conv. and telpher
	VERTICALS.											
V-2	Continuous	57	13'0	52'5	4'3	13'4	20'0	9'8	90	10	Discharged cold	Peck carrier
V-3	Continuous	28	10'0	63'5	5'8	7 8	22'9	0	..	..	Discharged cold	Indust. cars, plat. elevator
V-4	Continuous	41	15'0	56'5	0	5'5	22'2	15'8	100	0	Discharged cold	Weighing car, bucket conveyor
V-5	Continuous	28	10'0	48'3	0	24'6	21'8	5'3	100	0	Discharged cold	No screens
V-6	Continuous	56	9'7	50'0	0	15'0	21'5	13'5	100	0	Discharged cold	Special car, mono-rail hoist
V-7	Continuous	45	18'0	56'3	1'0	16'5	26'2	0	85	15	Discharged cold	Peck carrier
V-8	Intermittent	67	4'0	61'5	0	15'0	20'8	2'7	90	10	D. B. conv. and sprays	De Brouwer conveyor
V-9	Intermittent	58	3'0	48'2	0'3	22'4	21'4	7'5	98	2	D. B. conv. and sprays	Peck carrier, De Brouwer conv.
V-10	Intermittent	30	5'8	70'0	0	0	25'6	4'4	100	0	D. B. conv. and sprays	De Brouwer conveyor
	COKE-OVENS.											
O-2	Coke-ovens	560	5'0	95'0	5'0	0	0	0	40	60	Quenching cars and sta.	Belt conveyor
O-3	Gas-ovens	675	..	..	Sells all breeze	coke	..		35	65	Quenching cars and sta.	Belt conveyor
O-4	Gas-ovens	500	4'5	..	..	See foot note No. 2			60	40	Quenching cars and sta.	Belt conveyor

No. 2—Plant O-2—Sells all coke production except when demand necessitates operation of producers and water-gas sets.

responded—one giving actual operating figures, and the other representative figures from a number of plants. The Committee are, of course, not in a position to vouch for the accuracy of the figures reported by the various companies.

It was thought that the statistics presented would be of interest for two purposes—first, that they would assist in the selection of new plants; and, secondly, that they would enable operators to see what efficiencies other installations of the same type as their

own were making. It must be remembered, however, that the figures represent, as accurately as they could get them, what these plants have done over a period of about a year, and not necessarily what they could do. A direct comparison of results was found to be impossible for a number of reasons.

1.—The conditions under which the companies were operating varied considerably. Manifestly, it is incorrect to compare directly the results from plants using different coals, meeting different gas requirements, supplying different residual markets, &c. Due weight must be given to all such points, before an intelligent opinion can be formed.

2.—The methods in vogue for weighing, measuring, and testing the different products are not at all uniform.

3.—It is impossible to express some of the qualifications of the different systems in a report. For instance, the quality of the coke produced is frequently of prime importance; but there is no method in general use by which it can be accurately described. The amount of smoke made is sometimes an important matter; but it is impractical to try to describe its relative value in different systems.

The figures presented give as much information as could be collected in the time available; but they do not tell the whole story. All the surrounding circumstances must be given due consideration, to avoid error in interpreting the results.

In collecting the data presented, the Committee were especially impressed by the large variety of methods of determining the operating figures which prevailed in the various companies. Probably, the greatest difference occurred in the sampling and testing of gas for candle power and heating value. Some plants make one test a day on the gas as it passes the meter; others make similar tests every few hours; a third procedure is to use small tanks or holders to collect a sample over a period of eight to twenty-four hours, and to test this as representing the average. Obviously, these methods may give widely different results on the same gas. No uniformity was shown in the manner of reporting the tar produced or the carbonizing labour. The methods of weighing coal and coke are largely dependent on the design of plant; but even in the same type of installation, considerable difference was noted. While a certain amount of "individuality" must be expected in this matter, it would be of great advantage to the industry if the methods were standardized by an authoritative body.

The Committee feel that, in the limited time at their disposal, they could not collect all the information pertaining to the subject; and they recommend that the work be continued next year, with the idea of obtaining data from more companies and in greater detail than it was possible to do this year.

The fact most forcibly brought out in the work of collecting these statistics was the great need in the coal-gas field for uniformity in the methods of testing and measuring the products handled. The Committee recommend that the Institute consider the matter of publishing a manual which will give definite and detailed directions as to approved methods of weighing, sampling, analyzing, and measuring coal, coke, gas, and the other products which are produced in carbonizing plants.

Section II.

The increasing production of coal gas has brought the coke business into greater prominence than ever before. The Committee, therefore, had made a study, in a general way, of the means adopted by the principal companies for marketing and delivering this product, especially of handling it from the retorts to the storage pile. No attempt has been made to describe details of the mechanical equipment, as the scope of the table has been restricted to general information only. The data are presented in tabular form, divided into types of plant, for convenience of reference. From this table, the manager of a company who are considering entering the coal-gas field or adding a new unit to an existing installation, can see at a glance the methods which other representative concerns have found advisable to use in marketing their coke and in delivering it to consumers. Furthermore, the general layout of the conveying, screening, and quenching systems adopted by operators of the four principal types of carbonizing apparatus can be readily reviewed.

The results of the Committee's inquiries on the two subjects referred to in the report were set forth in two voluminous tables, from which we have selected some of the items of information of more general interest. In the first table, too, it has been necessary, from considerations of space, to confine the particulars given to two installations representing each form of carbonizing.

In the series of three Howard Lectures which Mr. J. S. S. Bramer is to deliver before the Royal Society of Arts, he will deal first with the economic importance of coal, the movement for economy, output and consumption for various purposes, duration of supplies, and alternative sources of energy. The subjects of the second lecture will be recent developments in the knowledge of the composition of coal, coal as a heating agent and source of power, and the bye-products from coal distillation. In the third, the lecturer will point out directions in which economy may be realized, and will deal with, among other matters, bye-product recovery, and economies possible from centralized systems of power generation and from the extended use of carbonized coal (including gas). Finally, he will have something to say about low-temperature carbonizing schemes. The dates of the lectures are Nov. 27, Dec. 4, and Dec. 11.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Thirteenth Annual Meeting of the Yorkshire Junior Gas Association took place last Saturday, in the Chemical Lecture Theatre of the Leeds University—Mr. John Demain, the President, in the chair.

The President, in opening the proceedings, briefly reviewed the conditions prevailing in the session just closing. He remarked that the Association had come out very well in membership and in other directions—better than they might have expected. He only hoped the Association might be in at least as good a position at the end of the coming session, both financially and otherwise. The past session started with a balance of £2 7s. 2d., and the session had closed with a balance of £11 14s. 10d. Personally, he was no believer in setting oneself, in such an organization, to create a big cash balance at the end of the year. What they wanted was acquisition of knowledge from the meetings. In regard to the work of the past session, he thought, taking it on the whole, it had been a very good one, considering the circumstances of the time. They had had a very difficult time to contend with, and this, combined with the poor facilities that now obtained for getting about as compared with previous times, had had some effect on the attendances at meetings. They had a result in work which he considered would compare favourably with any Junior Association in the country. Speaking of the coming session, he was able to give a rough sketch of what had been arranged, though he was afraid they would have difficulty in getting all that they would wish to have had. There was to be a paper on "Town Gas for Industrial Purposes," with demonstration, by Mr. W. B. Leech, the Leeds City Gas Engineer. On another occasion, the Council proposed to introduce the "question box" system—a very excellent type of meeting to have occasionally, if only to encourage shy members to voice their views. He hoped the members would bear this in mind, and be getting questions and answers ready. Those of them who hesitated to speak before the Technical Press need have no fear on that score, because nothing would be published on that occasion if the members so wished it. They were to have a visit to the works of their new President, Mr. J. E. Lister Cooper, at the Yeadon and Guiseley Company's undertaking. He believed they were also to have a visit to the New Wortley works of the Leeds Corporation, where there was a new and very extensive telpher plant and a benzol washing installation. They had in reserve a visit to gas engineering works within fairly easy reach, and also to gas-works where the new vertical carbonizing plant had been installed; and he thought this would be working by the time of the visit. It was an entirely new type of plant, and would be of great interest and of much educational value to those of them who, as most of them were, were accustomed to the old type. It was hoped, further, to have a visit to a chemical works. A great deal would depend, of course, on circumstances over which they could have no control, and which, as was obvious in present times, could not be foreseen.

Annual Report.

The annual report, presented by the Hon. Secretary (Mr. Edward Garsed) on behalf of the Council, voiced the view of the Council that, in recommending members at the last annual meeting to continue the work of the Association, despite the critical state of the country and the extreme pressure of work upon gas engineers, the attitude had been justified by the result of the year's working. The six gatherings which had been arranged were such, in spite of necessarily reduced attendances, as to maintain the usual high level of Association work. The ordinary membership of the Association, in the face of resignations and removals which had occurred, still stood at 111. Of these, so far as was at present known, 24 members were serving in His Majesty's forces. The Council again confidently recommended the continuance of meetings, and were able to state that there were indications of suitable arrangements for an adequate programme for the coming session. There had been four Council meetings held since the last report; and the attendances at these had been remarkably good. The best thanks of the Association were again extended to those engineers whose works had been visited; and the Council offered hearty congratulations to Messrs. Demain, Balmforth, J. W. Roper, J. H. Smith, and J. Smith, who had, so far as was officially known, gained professional promotion during the year.

The President, in moving the adoption of the report and statement of accounts, said a question arose as to the disposal of the balance of £11 14s. 10d., or a portion of it. There had been a strong feeling among the Council that it might be well to make some donation to the Red Cross Society, the Y.M.C.A., or some similar institution of good work.

A resolution was moved and seconded that two guineas be given to the Red Cross Society and a similar sum to the Y.M.C.A. Eventually, however, it was resolved, on the motion of Mr. Gillett, to give £5 to each of these institutions.

The President moved the election of Mr. W. B. Leech, Leeds City Gas Engineer, as an honorary member. Mr. Leech was a man to whom the Association owed a good deal, and they would find him a valuable member.

The proposition was seconded by Mr. Gillett, and carried unanimously.

Induction of the New President.

The President, in vacating the chair in favour of Mr. J. E.

Lister Cooper, of the Yeadon and Guiseley Gas Company, who, as Senior Vice-President, automatically became President, said he hoped Mr. Cooper would have as successful a year as he (Mr. Demain) had had, and that he would be favoured by good attendances, despite the difficulties of the times. Bad attendances were discouraging to a President; and he could only add that, in the circumstances, the members had supported him very well during his term of office.

Mr. COOPER then took the chair.

VOTES OF THANKS.

The new PRESIDENT, in thanking the members for the honour done him, said the presidency was something which had come to him much sooner than he had ever thought likely. He had pleasure in moving that the best thanks of the Association be tendered to Mr. Demain for his services. Mr. Demain had occupied the chair with great ability during a most trying period, and the result spoke for itself.

Mr. JAMES A. LEE seconded the motion, which was carried with acclamation.

Mr. DEMAIN, in expressing thanks, said if there was any particular credit due to anybody it was to the members for their loyal support. He wished to move a vote of thanks to his colleagues in office during the year,

The motion was seconded by Mr. COOPER and carried.

ELECTION OF OFFICERS.

The election of other officers, by ballot, resulted as follows:

Vice-Presidents.—Messrs. Edward Garsed and J. M'Lusky.
Hon. Treasurer.—Mr. Peter M'Nab.
Hon. Secretary.—Mr. W. H. Riley.
Assistant Hon. Secretary.—Mr. E. L. Oughton.
Members of Council.—Messrs. W. W. Atley, J. Denham, A. Edwards, Chas. Roper, and J. W. Roper.
Hon. Auditors.—Messrs. A. Lister and G. H. Walker.

The PRESIDENT said he was highly pleased to note the good attendance, and gratified at the presence of Mr. E. H. Hudson, of the Manchester Institution, and Mr. W. D. Helps, of Messrs. Jas. Milne and Son. He then delivered the following

PRESIDENTIAL ADDRESS.

Mr. COOPER then proceeded to deliver his address, which he opened with some remarks on the work of the Junior Gas Associations, the importance of which he emphasized, particularly as affording opportunities for the dissemination of up-to-date scientific methods and knowledge among those not fortunate enough to be able to take first-hand advantage of the higher education obtainable at the universities.

EFFECT OF THE WAR.

The effect of the war on the gas industry, he proceeded, varies in different districts, as demands have arisen. The establishment of munition works, and other direct causes, have resulted in an increased output in many areas; while in other localities lighting restrictions, which may or may not be too severe in places, have caused a decreased output.

Difficulties of obtaining adequate supplies of coal are likely to increase rather than diminish, as winter approaches. The coal contracts made to cover the ensuing twelve months are to us far from satisfactory, both as regards price and proportionate rate of delivery in winter months. Take a works using (say) 10,000 tons a year, and needing at least 60 per cent. of this quantity during the six months October to March. Contracts for deliveries in equal monthly quantities mean that the works are short of coal over these months to the extent of at least 1000 tons, which is tantamount to an advance of maybe an additional 2s., 3s., or 4s. per ton on this quantity—varying, of course, with the cost of taking from stock and building same up again, granting that labour may be found to do so. Even then, the risks of being without coal are aggravated by the fact that the periods of maximum requirements will, in regular course, have to be repeated. As regards price, one can cope with a definite advance, serious though it be, but at present there is little security. We are left to the mercy of every ill wind that blows, just as if our industry was one of little moment, whereas it is one of the most important in the country, and more than ever necessary at this crisis. It is to be hoped that the recent interview of our Premier with the miners and coalowners representatives, *re* absenteeism, will result in the desired increase of coal output, and to this extent relieve the situation, and tend to steady prices.

There are considerations which alleviate to some extent the high prices for coal, foremost among which is the coke market. This is something to be thankful for. In my opinion, coke did not get its fair share of appreciation, either as a domestic or industrial commodity. We hope, therefore, that its value will be more firmly established, so that after the war the demand for it will be permanently increased.

Tar also calls for our attention. The low prices ruling are due to causes which will not last very long; and when the products of tar again become saleable, and their uses and possibilities are thoroughly investigated and appreciated in this country, prices hitherto unknown will be the rule. Tar circulation for the extraction of toluol has resulted in some cases in enhancing the price. At the same time, those works where this is carried out have the satisfaction of knowing that they are doing a duty to their country. It is not to be expected that every works can go the length of benzol recovery. Patriotism calls for it at present; but, from a commercial standpoint, the question extends to the future, when most likely the price of benzol will be a very different one from that which rules to-day. This question well merits full discussion.

The labour problem is a cause of much anxiety to-day; for, though, like most, the gas industry has been practically immune from strikes, we can only come to the conclusion that it is owing to the war that the blessing is vouchsafed us, because an undercurrent sometimes makes its existence evident. This is therefore a question of much moment for the future. Even at this time, demands for increases of pay (apart from war bonus) are made, simply because the amount per shift is slightly higher in another district. These demands are put forth without consideration of the conditions in the different works; but whether justified or not, they must be met by concessions and conciliatory methods. It is coming more to be recognized that, properly applied and managed, good wages, provided that those who receive them feel any proportionate obligation to give in return "labour worthy of its hire," is not an outcome which should cause unmixed feelings of regret. In determining rates of pay, there should be greater regard to the differences in local conditions and circumstances, when comparing one place with another, which would tend to mitigate labour grievances.

Entering deeply into the question of labour in the future, will be that of demobilization. It is a matter of immense magnitude—as great a problem as, if not greater than, mobilization. But I do not intend to say much about it. It is certain the powers that be will be prepared with a scheme for carrying out the whole business. It is not to be expected that the three to four millions of soldiers will be returned to civil life in a week or a month, even if it were possible; but, be it done out of necessity very gradually, there is no getting away from the fact that, when complete, there will be three to four million more men available to make ploughshares instead of swords.

The way in which the returned soldiers are treated will have a great effect in securing the industrial peace between masters and men which we all hope for. The country ought to treat them generously. Difficult as the problem is, it will afford a grand opportunity of inspiring greater co-operation among all classes. In the first instance—or rather at the beginning—military reasons will enter largely into the disbandment of our armies. Later they will have to be disbanded by civilian considerations, according to, and in proportion to, the call for each of the multitudinous kinds or classes of employment. When peace is declared, we shall be face to face with industrial re-establishment; hence, when the time arrives, civilian interests must dominate all others. It may be taken for granted, however, that in future labour costs are going to be higher than in the past; and it behoves all who are in charge of gas undertakings to make every effort and calculation, with a view of meeting these costs by bringing about a greater productive capacity per man, by the installation of verticals, machine-stoked horizontals, or other labour-saving devices.

RENEWAL FUNDS AND INCOME-TAX.

It is a mistake to delay the installation of this kind of plant in any works where the minimum make is large enough to warrant it. This is especially the case with an undertaking which has built-up a fund for the renewal of obsolete plant, to the limit allowed by the company's Special Act, and upon which fund income-tax has been paid, each year as it was accumulating, at the old rate of 1s. and 1s. 2d. in the pound. This brings me to a matter which was discussed in the Technical Press a few weeks ago—whether allowances for renewals of works and plant should be made at the rate of tax in force at the time the plant is renewed, or whether they should be calculated on the average rate of tax for the particular plant which is being claimed for, or, to put it another way, at the rate of tax in force each year as the renewal fund was built up. There are divergent opinions between income-tax surveyors and those who claim the allowance. Surveyors will argue in favour of the average rate; but the "Gas World" hits the nail on the head by asking, Would he so argue if the rate of income-tax had gone down, instead of up?

Most of those who have had the income-tax assessments under hand will have thought it extremely unjust that the amount appropriated to the renewal fund year by year should not have been deducted from the assessment, and now quite fairly take the view that allowance should be made at the rate of tax in force at the time the fund was expended, because that basis would have been adhered to by the income-tax authorities had the rate of tax gone down. Properly dealt with, however, this is a question which can be brought to a satisfactory settlement. There are cases where the full value of the discarded plant has been allowed off the assessment at the rate of tax in force at the time the renewal fund was spent.

GAS SUPPLY QUESTIONS.

Much has been done in recent years making for reduced cost of production. This is evidenced by the simple fact that, while the price of coal has more than doubled, the price of gas has decreased more than 50 per cent. in the same period. Still, in the perfection of methods in use for making and purifying gas, there is much room for further improvement. Circumstances beyond our control often make for increased prices. We must see to it that matters under our control make for reduced prices.

It is no longer necessary in these high-pressure and incandescent days to use gas of such high illuminating power. The bar

photometer must be abolished and substituted by a calorimeter. Years ago in Germany a system was in being to supply a whole district with practically unmixed water gas, with quite a small percentage of mercaptan passed into it to impart a smell, and thus eliminate any danger which it is quite evident there would be in the event of leakage of an odourless gas.

Further extension of the use of gas is to be looked for, not so much in lighting as in the direction of heating, cooking, and power; so we must cultivate these branches of the industry and run them for all they are worth. It is difficult to imagine even an ordinary cottage household which would not find some purpose for the use of gas, other than lighting, if well looked after; and having once been installed and used properly, consumers would be surprised how they had managed to do without it.

This question involves the education of the gas-fitter. It is encouraging that the matter is now receiving the attention it demands, and that the technical classes in the subject are proving a great success, because the possession of technical knowledge of gas and gas-fitting is becoming more apparent. It is difficult to enumerate the many and varied forms of operation and apparatus with which the gas-fitter comes into contact. Suffice it to say the rapid production of improved methods of using gas requires a deeper knowledge of principles, owing to an ever-increasing supply of material for study and investigation. The question of taking advantage of the multiplication of methods of using gas is a big one; and while I would not not go so far as to declare in favour of free installation all round, yet I think a great extension of a generous hire-system is called for.

Publicity, by exhibition, canvassing, or many of the excellent types of advertisement, is very important in this connection. But a more important and effective method still is to be provided with a show-room well fitted up for demonstrating the various uses of apparatus and appliances. A better and more efficient organization in this department of the industry is necessary; for competition will become keener. It is imperative that we should appreciate this and organize our forces to meet it. Then we need have no misgivings about the sale of gas, which will increase in proportion as the basis of supply is made broader.

This is a side to the question of which, with comparatively few exceptions (and to these all due credit and honour are given), we shall have to admit a regrettable neglect, or lack of appreciation of the possibilities for selling gas. We need thoroughly-well equipped and ventilated show-rooms, so as to make it convincingly clear to the public that gas, as a medium of light, heat, and power, means "Efficiency with Economy."

We now come to the question of power supply. Faced with a prospective power user, the chief consideration is, What will it cost to run? We welcome this consideration in all departments of the industry, and in none more than this one. Suction gas is really not such a formidable competitor; but this needs bringing home to the prospective user before the apparatus is installed. Once it is installed, even if there is no saving, the natural tendency is to go on with it, trying to get something out of it. Still, I know of cases where the plant has been discarded in a comparatively short time.

We need to show how costs are sometimes overlooked or minimized in calculating this matter—such as labour costs in working, floor space occupied, difference in power developed by an engine with lower-grade gas, cost of converting the engine to work with a lower-grade gas, renewals and repairs to gas plant, capital cost, &c. Compared with electricity, gas for power is unassailable on the score of economy. Take gas at 2s. 6d. per 1000 cubic feet and electricity at 1½d. per unit, it only costs one-half as much to run by gas as by electricity. The latter has some success in places, owing to having a hire-system in operation. We, as power suppliers, need to do more in this way, in order to meet this kind of competition. It is certainly a matter for serious consideration.

High-pressure distribution and installation on the consumers' premises are much in evidence in some districts, and will no doubt be more so in future, as apparatus for the use of gas at high pressure develops, not only for industrial purposes, such as furnace work, but for lighting. We must remember that high-pressure lighting is the keystone in the structure for competing with electricity. This system must be fostered, as the cry after the war will be "More Light."

It is very desirable that a uniform basis of agreement for the lighting of streets should be adopted. To my mind, the lighting of a township ought to be more under the control of the gas authority, as making for greater efficiency and economy. This question is much facilitated now by the advent of automatic and pressure-wave lighting.

All these matters are very briefly dealt with; but underlying them is a proper supply of gas with adequate and uniform pressure. Too much attention cannot be devoted to this, by the installation of district governors on mains after a careful study of the consumptions and pressures in different areas. A universal scheme of pressure is very difficult to obtain under existing conditions of piping arrangements. House piping either inadequate in size or defective in the manner of laying is detrimental. The gas industry must co-operate more with architects and builders, who too often regulate the size of pipes out of all regard to the demands upon them.

There is a great future before the gas industry, which is only in its infancy; and it is up to us juniors to uphold this future. Let us, therefore, be determined to go forward on the path of progress, and all will be well.

Mr. W. D. Helps said, though it was not customary to discuss a presidential address, he would like to say how pleased he was to be among the Yorkshire Juniors again. It was only his second visit; but there was a particular pleasure that day because of the election of the new President, whom he had known for twenty-five years. He cordially congratulated Mr. Cooper upon his election, and also upon his address. If there was one thing more than another which he (Mr. Helps) was anxious to impress upon every man in the industry at the present time, it was the need for concentration on bringing about a settled state of affairs in regard to labour. After the war was over, it would affect everybody, and would control the future good and success of the country. The capitalist with money and the capitalist with labour must be brought to work hand in hand, and each must give the other of his best. He realized more and more that the country must get that confidence between the man who had the money to pay—whether he had earned it or had it left to him—and the man who had labour to give. The man who had capital in the form of health and skill must be convinced that he would be properly recompensed for his labour. He must be made to have confidence that if he had the ability and the willingness to work and produce he would receive the consideration and treatment by the man who paid, which would induce him to put forth his full man power. If this was not achieved, the country would not be successful after what it was now fighting for. He mentioned this matter some six or eight years ago in an address he had delivered in London—that so long as other countries paid men good wages we could afford to do so; but our men must, with their good wages, give value for money. At the present time they were faced with a grave matter in all directions of manufacture and production, and that was the binding down and limitation of wages to a dead-level under the trade union idea. There was any amount of evidence showing that many men, by putting their best into their work, could earn 30 per cent. more wages than the limitations allowed; and if these men could earn this higher pay, it would mean, if they were allowed to do it, so much more work to the good of the country. The masters must get the men to have confidence that the price of what they had to give would not be cut-down after the war on the grounds that they must then accept a peace-time price. If a man could earn it, let him have it. [Hear, hear.] This was a question that would have to be brought up when the present conflict was over. All stagy politicians must be got rid of, and real men must be sought among the capitalists of money and the capitalists of labour; and they must be got together to work the matter out together. The whole of the future depended on this question of money and labour. There was one other point he would mention before he finished. This was in regard to efforts to develop the gas industry, as mentioned in the President's address, by show-rooms, demonstrations, and partially giving gas-fittings, &c., to encourage gas consumption. As a member of the British Commercial Gas Association since its inception, and a member of the Executive, he would like to assure those present that day that the many compliments and congratulations and thanks which that body received from one place and another, not only in this country, but all over the world, were thoroughly deserved. Any member there that day who had any influence with his authorities would do well to bring this organization before them. Nobody knew, except the members of the Executive, the amount of undercurrent of advertising of the gas industry which was done by the "B.C.G.A." in advancing the use of gas for every conceivable purpose.

Mr. E. H. Hudson, in proposing a vote of thanks to the President, said it was not customary to discuss such an address, simply because they should be prepared beforehand if they intended to do the occasion justice. The President's address that day must give them all an opportunity for serious thought. Mr. Helps, as an outsider, had certainly added to the value of the address by emphasizing certain points. The points he brought forward—particularly that of advertising the industry—were of great importance. He thoroughly endorsed Mr. Helps's remarks about the "B.C.G.A." Every gas undertaking ought to subscribe to the organization, if it was really intended to follow up, before the public eye, the many uses of gas to which the President had drawn attention. They were selling their wares, and, quite rightly, they put the best picture they could before the buyer; but think of the additional influence upon the public mind if they were shown independent testimony, in the form of scientific results by independent authorities, of the work of gas, in support of the contentions held forth by the industry itself. There was no gainsaying the fact that what the "B.C.G.A." published courted criticism, and did not fear it. He had listened to the President's address with great interest, and he thought it would give every member, when it was in print and available for closer study, food for thought. The future had to be faced; and they must proceed to get ready now. They would have high prices of coal, labour troubles, and difficulties innumerable; and now was the time to get their house in order, so that they should deal with the problems as they came along.

Mr. Charles Roper, in seconding the vote of thanks, said he was quite sure Mr. Cooper had opened up a large number of points on which there was much to be learned and much to be thought about. He had done his best to touch on almost everybody's work, and he (Mr. Roper) thought most of the members would find something in it on which to base some question or small statement for the proposed question-box meeting.

Mr. Demain, supporting the vote of thanks, said the point had

struck him very forcibly that, though many gas engineers still had an idea that the industry had almost a monopoly as suppliers of cooking and heating power, the fact must be faced that in the times to come they were going to meet with very serious competition from the electrical profession in cooking and heating. Like they of the gas industry, the electricity people were striving their utmost, as they had already done in lighting, to get from the gas industry in cooking and heating what they had done in lighting. As Mr. Hudson had remarked, they would have to look out, and they must develop all the labour-saving appliances possible, and turn out a first-class service.

The motion was carried unanimously.

The PRESIDENT briefly responded, and the proceedings then ended.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DIVISION.)

The Eastern Division of the Scottish Junior Gas Association met at Kirkcaldy on Saturday, After a visit to the Corporation Gas-Works, the members met in the Masonic Hall. Mr. J. J. SCOTT (Kennoway and Largo), the President of the Association, occupied the chair. There was a fairly large attendance of members.

Mr. D. CAMPBELL (Kinross) read the following paper.

ERECTION OF A NEW RETORT-BENCH AND SOME DRAINAGE DIFFICULTIES.

In the erection of a new retort-bench which I carried through at Pittenweem, I at first decided on a bench consisting of three ovens set with four retorts in each oven, and that it should be constructed on the semi-regenerative system of Hislop's patent, and upon the same ground as the existing bench of direct-fired furnaces.

After demolishing the greater portion of the old bench, the task of excavation was commenced. From the point I agreed upon for my floor-level, we had to go a depth of 5 feet, as the depth from the sole plate of the furnace to the floor line is 4 ft. 2 in. We had not gone quite 2 feet when the discovery of rock and water was made. First attention was given to ascertain the nature of the rock—how it was bedded-in, and the most methodical way of removing it. We found it to be of a whin nature of sea-rock, lying in very large sections, which had to be completely relieved at all points before blasting operations were performed by practical quarriers. During the time this was in progress, the water trouble became more and more in evidence; so my attention was given to overcome this difficulty. In the extreme corner, where I decided to form the stoke-hole of No. 1 oven, a hole was made to the depth necessary to convey the water when our real depth was reached; and by forming a temporary channel to this hole as our depth was being obtained, we had no further difficulty. The outlet from the hole formed was led into a main drain allotted for itself alone.

After we came to the depth desired, it was now most important how the water had to be dealt with for all time. I first caused to be broken the very hardest of the whin rock into pieces of (say) 3 inches, giving a layer of it throughout the water, which formed in itself a clear unobstructed rumbling drain. I then covered it over with perforated plates, which I had at disposal, and finished by giving the desired thickness of concrete, made up of two parts of material to one of best brand of Portland cement. Each oven is carefully drained in this way underneath the stoke-hole floors, which are formed in one long subway. By adopting this method, one can clearly follow that either surface or spring water is being allowed to follow its natural course beneath the real concrete foundation of the pier walls or any part of the bench whatever. I have never had the slightest indication of any failure in this method of dealing with water.

Coming to the erection of the retort-bench, very special care has had to be exercised in setting-off, forming true levels and sizes. This requires the builder to maintain the exact size or thickness of walls as specified, when the first course is tightly laid, and each brick hammer struck.

Dealing with the dimensions of the bench, the outer walls are of 14-inch fire-brick, with an additional wall of 9-inch composition brick, which is continued right up the full height of the finished work. The centre division or pier walls are 18 inches thick, well floated in fire-clay, specially ground. The back wall of the bench is 23 inches thick; and in it the exit flues from the ovens are arranged, 9 inches square. The main flue leading to the stalk is formed on the top of the bench, 18 inches wide by 12 inches deep. At the point where the uptake flue enters the main, each of them is arranged with a heavy fire-clay damper, which proves most useful and effective when it is needful to shut-down the settings.

In addition to this damper, I arranged a very handy one over the first run of the waste-gas flue, which is formed a little above the floor-line. The bench is bound back to front with eight H steel beams 8 inches by 5 inches, sunk 2 feet in concrete and projecting 2 feet above the top of the bench—each pair of beams being fixed together with a 5-inch square H steel binder, together with cradles, forming a seat for the hydraulic main, which is 2 ft. 6 in. above the finished brickwork. On the ends of the supports are three H steel beams screwed sufficiently tight together by 2-inch steel rods. The width of the ovens inside is 7 ft. 6 in.; the length being only 8 ft. 6 in., which was caused by the original width of the old retort-house. On this account the retorts were provided over the standard size; the inside measurement being 22 inches by 16½ inches.

In front of the settings, the floor covering the subway is ¼-inch steel-corded platings; all other parts of the retort-house floor being finished off to the same level in cement of a very strong proportion.

The mountings appear more massive than are usually seen in small gas-works, as will be readily understood from the measurements given of the retorts inside. The ascension, bridge, and dip pipes are 7-inch diameter. The steel hydraulic main was completed with an assurance of ½-inch seal, quite independent of the seal-regulating valve attached.

The design of the retorts in the settings is of a simple and substantial nature. All transverse walls and combustion chambers are of silica materials. The front walls over the retort necks are 14 inches thick, making provision at all parts for free access for cleaning and inspection purposes. Let me add that when the scheme of reconstruction was finished, and the new bench was in full use over the first winter, the Directors of the Pittenweem Gas Company had every reason to feel pleased with their venture in remodelling this part of their works.

The whole of the work was carried out under my own direction and personal supervision—no part of it being contracted for.

In the manufacture of gas under modern conditions, one has to be continually on the lookout for opportunities for little improvements either in one direction or another. In my case, the next thing that claimed attention was the exhausting plant. This was driven by a small gas-engine of Waller's make; and at the time it had been in use for seven years. We continued to have much trouble with the engine, which, to a great extent perhaps, arose through its being too small for the work it had to do. Without hesitation, my Directors again agreed to go in for improvements and to keep going ahead; so we decided upon a steam generating plant.

We began by converting a spare part of our coal-store into a boiler-house, and installed a Cornish boiler (size 14 ft. by 5 ft.), and a chimney stack 50 feet in height was built for the use of this boiler. We were fortunate in having a piece of ground conveniently adjoining the retort-house well-suited for an engine-house, which when finished allowed ample accommodation for much more than the necessary plant. The new engine and exhauster selected was of the Bryan-Donkin make, and capable of passing 5000 cubic feet of gas per hour. The amount of satisfaction gained from the working of this plant is also of a very high order indeed; and what was of not the least importance, was the fact that all the materials were purchased when prices were very much lower than they are now, and more in the buyer's favour.

Previous to the time to which I am referring, the works were using two sets of condensers, a tower scrubber, and a very efficient and up-to-date set of three purifiers, 10 feet square and 4 feet deep, rubber sealed (made by Dempster, Limited), with Weck's patent valves attached.

To conclude this somewhat brief and incomplete description of the gas-works at Pittenweem as they exist at the present time, I make bold to venture the opinion that they will compare favourably with, and rank as high as, any works having at least the same scale of production.

Lastly, I am strongly of opinion, gathered from experience, that in a small works or works of medium size, it is advisable for the manager to personally supervise the carrying out of alterations at the works or the erection of new plant, as thereby are gained a useful and varied experience and an acquaintance with the working detail which otherwise it would be impossible to possess. There is also the peculiar pleasure so dear to the heart of every gas manager, of having wrestled with and overcome his own peculiar set of difficulties.

For myself, I had always reason to feel very grateful to my Directors for the very sympathetic way in which they entertained all suggestions for improvements in the way of renewals or repairs and extensions—expressing a confidence in their manager which tended to a unity of purpose resulting in the furthering of the best interests of all concerned.

Discussion.

The CHAIRMAN, after congratulating Mr. Campbell, said he had been at Pittenweem and had seen the improvements which had been carried out there. The main point related to the foundation difficulties with the water. He wished to know whether the water came from a spring through the rock or was it surface water.

Mr. JAMES KINCAID (Kirkcaldy) said it struck him as unfortunate that Mr. Campbell had only length for 8-feet retorts. If another foot had been possible, it would have made a big difference. It would have been interesting to have had some of the working results, with the old and new benches. Mr. Campbell was very fortunate to have had the confidence of his Directors, because in such circumstances one carried on the work with special interest and special care.

Mr. H. GOURLAY (East Wemyss), referring to the flue to the chimney, thought it might have been better to have had it deeper than 12 inches.

Volker Mantles

Combine strength with durability, and embody all the essential features for good lighting. They are **BRITISH** made throughout with **BRITISH** material and by **BRITISH** labour, and always have been.

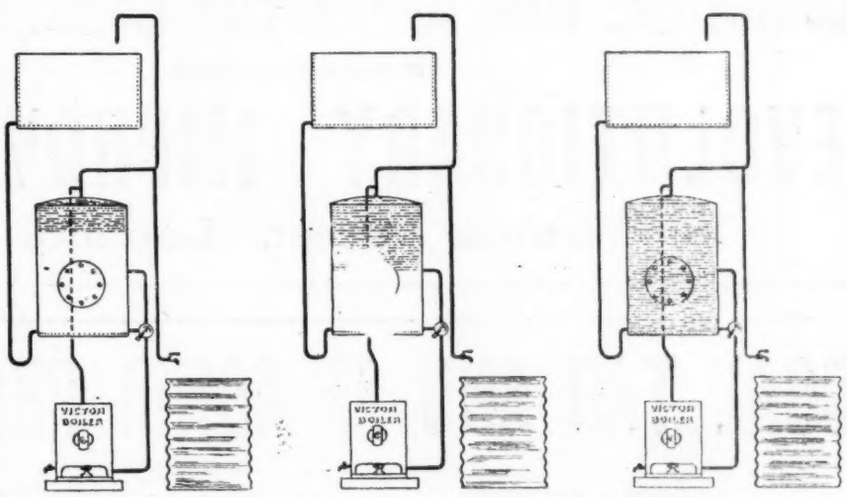
The Volker Lighting Corporation, Ltd.,
Garratt Lane, Wandsworth, ———— LONDON, S.W.

GAS-HEATED HOT WATER SUPPLY.

Example of the "VICTOR" System of Gas-Heated Hot Water Apparatus in circulation.

THIS illustration shows in three stages the effect of the "VICTOR" system of pipe connections, with the Cut-out Valve. Under this arrangement the contents of the cylinder heat from the top, storing the water at the temperature at which it circulates from the boiler, viz., about 150 deg. Fahr. This enables a small supply to be obtained at the sink or lavatory, heating a few gallons, and shutting off the gas, supposing no further demand exists for the time being.

Working from right to left, the illustrations show the action of drawing water as it should occur, the cold entering the bottom of the cylinder and following the hot water until the whole is exhausted. The cold water should not be allowed to mix with the hot in delivery.



The Cut-out Valve fitted in the lower return connection controls the circulation of the lower half of the contents of the cylinder, so that a reduced supply can be held in reserve when baths are not in demand, with economy in gas consumption.

THOMAS POTTERTON,

Telephone: STREATHAM 1860.
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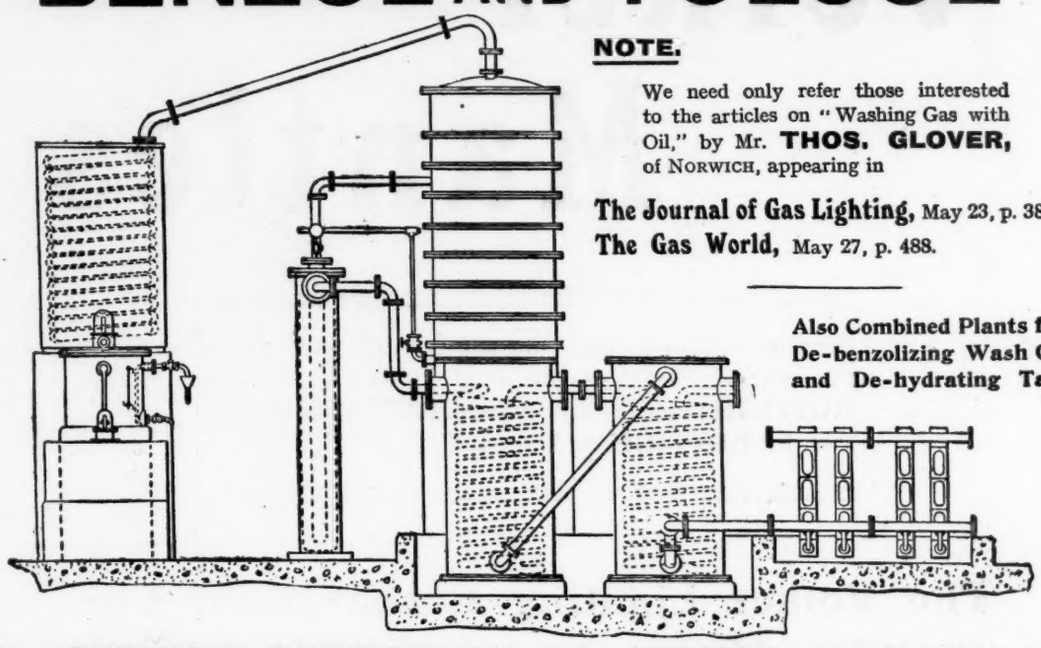
EFFICIENCY GUARANTEED.

Wilton's Process for the Recovery of BENZOL AND TOLUOL



NOTE.

We need only refer those interested to the articles on "Washing Gas with Oil," by Mr. **THOS. GLOVER,** of NORWICH, appearing in

The Journal of Gas Lighting, May 23, p. 387.
The Gas World, May 27, p. 488.

Also Combined Plants for De-benzolizing Wash Oil and De-hydrating Tar.

The CHEMICAL ENGINEERING CO., HENDON, LONDON, N.W.

CARBURETTED WATER GAS.

ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LTD.
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Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia containing a Guaranteed Minimum of 25 per cent. Ammonia.

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Mr. J. D. Luck (Markinch), alluding to difficulties he had experienced with water in the foundations, said they found it was coming from the old workings of a coal-pit 300 yards away. They found it was necessary to sink a well 12 feet deep and pump the water out of the well, and thus overcome their difficulties.

Mr. J. R. Moyes (Edinburgh) asked if it was tidal water which caused the trouble, as this was frequently met with near the sea. He approved of Mr. Campbell going in for a substantial construction. Referring to the manner in which a seal was provided for the hydraulic main, he considered hanging from the roof was better than using the structure itself for support. Although a lot of expense might be laid out on the roof, it did away with the structure, and kept the floor-area clear.

Mr. Campbell, in replying to the questions, said the class of water they had to deal with was both surface and spring water. The ovens were arranged so that a setting of five could be put in at any future time. With regard to the question about results, he pointed out that he went to Pittenweem during December—a very busy time. The manager who preceded him had been there for forty years, and there was no record of makes, and the place was stocked with cannel coal. In the first winter they tackled the alterations.

Mr. Campbell having been cordially thanked for his paper, the members were afterwards entertained to tea by Mr. Kincaid.

ORNAMENTAL METAL SHADE REFLECTORS.

A fortnight ago, when drawing attention to some very serviceable metal shade reflectors and reflecting curtains being made by Messrs. A. E. Podmore and Co., of Charles Street, Hatton Garden, it was mentioned that there was evidence in the firm's workshops that householders and others who might desire to have something more ornate would find what they wanted there. A shade which should satisfy them is illustrated here. It is in black metal, and glass of any colour to cover the side openings can be easily slipped in and out. The shade, which is attached by screws to the globe gallery, will fit all standard size burners; and its use results in a very effective distribution of the light. Both neat and pretty in appearance, there are endless places for which it is adapted—shops, private houses, and public buildings.

Gas-Lighted Railway Trains.

Reporting to the Board of Trade on the result of his inquiry into the causes of a collision which occurred at the beginning of September between two passenger trains, at Warminster, on the Great Western Railway (caused by the failure of an engine-driver to observe or obey danger signals), Major J. W. Pringle says that in the case of the one passenger who died, the fatality was described at the inquest as being due to shock, partly possibly from the collision, but mainly from superficial burns. Two other passengers travelling also in the last coach of one of the trains suffered from burns on the face and hands. "The outbreak of fire under this coach," he says, "originated in an explosion of gas which issued from two cylinders carried under the flooring. These cylinders measure 8 feet in length with a diameter of 16 inches. The fitting at the leading end of each cylinder was knocked off, leaving a hole $\frac{3}{8}$ inch in diameter. It is estimated that, with an assumed pressure of 100 lbs. in the cylinders, the gas would leak out of a hole of this diameter in about two minutes. The ignition of the gas after it escaped appears to have been caused by a match struck by one of the passengers who travelled in the coach. Recommendations in favour of electric lighting, steel construction work, shock-absorbing buffers, &c., have been made in several previous reports upon railway accidents. This case is a further illustration, if such were needed, of the additional risk incurred in any railway accident by the use of gas as an illuminant. The four-wheeled stock on both the trains was of the close-buffered gas-fitted type known as 'Metropolitan' stock. The vehicles were constructed in 1893 for service on the Metropolitan and Great Western Joint Line, and have, of course, since been replaced for underground service by electrically lighted stock. The requirements of traffic, especially for military movements, have rendered necessary the use of stock which is ordinarily kept in reserve for emergency."

Tipperary Gas Company.—The Tipperary Urban District Council have referred to their Law Adviser a statement from the Secretary of the local Gas Company foreshadowing a possible closing-down of the gas-works, owing to the unprofitable working, unless the Directors could increase the maximum price of gas, fixed by the Order at 5s. per 1000 cubic feet. The Town Clerk said such an increase could not be enforced.

A French Dye-Stuffs Syndicate.—The Paris correspondent of the "Morning Post" states that some interest is taken in financial circles in the announcement that a French national dye-stuffs syndicate is to be formed with a capital of £1,600,000, to act in conjunction with British Dyes, Limited. The shares will probably be issued at the end of this month, and the Banque de Paris et des Pays Bas will be at the head of the issue.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

South Suburban Locomotives.

Sir,—We note in your issue of the 7th inst., a reference to one of our engines, which we supplied some few years ago to the South Suburban Gas Company.

There is one serious mistake in the article communicated to your pages, as the engine is not "chain driven"—the drive being taken through a train of gearing from the crankshaft to the driving wheels. A chain-driven engine of this type has not been made by us for very many years.

Rochester, Nov. 11, 1916. Aveling and Porter, Limited.

British Coalite and Low-Temperature Carbonization.

Sir,—I am instructed by the Board of my Company to ask for your authority for the statement, contained in a short article headed "Friendlessness of Low-Temperature Carbonization" in your issue of the 7th inst. (p. 277), that "the difficulties of the Barnsley Fuel Company, and the loss of further patronage from the Government, have given an additional set-back to any prospects that the Coalite Company fondly thought they possessed a few months ago." This statement is almost equally compacted of direct and oblique falsehood. The Barnsley Smokeless Fuel Company is in no difficulties of the kind suggested, although, in common with all companies and individuals engaged at the present time in putting up plant and machinery of an extensive character, its efforts have been hampered by the state of the labour market and the difficulty of obtaining plant from some machinery manufacturers, owing to the demands made upon the latter by the Military Authorities.

The Barnsley plant, however, is now within a few weeks—or, at the outside, a very few months—of completion. If it should not, in its ultimate result, be the success that my Company anticipate, then you and other hostile critics will be able to give yourselves the pleasure of recording that fact.

The allegation that the prospects of the Company have been blighted, owing to the "loss of further patronage from the Government," is almost grotesque in its misrepresentation of the actual facts. The Government, which has from its inception had a considerable financial interest in the Company, was, when it became necessary to place some more of the authorized debenture issue, very naturally given the opportunity of making a further subscription. It eventually decided against doing so; and the whole of the remaining debentures have been placed in other quarters.

The malice and prejudice that characterize the whole tone of your article are so obvious that they may be left to the judgment, and the consequent condemnation, of all gas engineers who are neither blinded by prejudice against all new processes nor are the exploiters of other so-called "low-temperature processes."

Henry Bacon.
62, *London Wall, E.C.*, Secretary, British Coalite Company, Limited.
Nov. 10, 1916.

[The foregoing letter will interest our readers equally as much as it has done us. We fail to see in what way the statement quoted in our correspondent's letter is "almost equally compacted of direct and oblique falsehood." This phrase is a solid looking one; but it has proved so resilient that it has done no damage. It, however, painfully reminds us of the early coalite prospectuses (of which probably Mr. Salisbury Jones retains a few samples), and of the spotless statements contained therein. The remark that has given chief offence to the British Coalite Company is: "The difficulties of the Barnsley Fuel Company, and the loss of further patronage from the Government, have given an additional set-back to any prospects that the Coalite Company fondly thought they possessed a few months ago." Now we are told that the Barnsley Smokeless Fuel Company have had "no difficulties of the kind suggested." The penetrative power of the British Coalite Company is great. It was not previously within our knowledge that we even "suggested" the nature of the "difficulties" of the Barnsley Fuel Company that were in our minds. Our readers are therefore confronted by the metaphysical problem as to how the British Coalite Company came to ascertain what was in our minds without any open declaration on our part. But before the accusation of "direct and oblique falsehood" has time to get cold, the Company proceed to admit the existence, owing to current circumstances, of difficulties which were well within our knowledge. As to the patronage of the Government, we recommend the Coalite Company, if under any misapprehension as to their intentions, to read or re-read as may be required a report in our "Parliamentary Intelligence" of Aug. 22 (pp. 354-355). Dr. Addison, according to the official report of the debates in the House, said at that time: "The Government has not been disposed to assist further in view of the slow progress made in the construction of the plant by the Company, and because it now appears doubtful whether the process would prove of much service in the direction of munitions." Dr. Addison will be interested, seeing that no mention was made in our paragraph as to "the prospects of the Company having been blighted," to know that his declaration is "almost"—that is to say, not quite—"grotesque in its misrepresentation of the actual facts." Perhaps Dr. Addison's statement is also compacted of "direct and

oblique falsehood." Mr. Bacon and his Board are welcome to every particle of solace that they can derive from their suggestion of "malice and prejudice." However, we leave their singularly worded letter, with its accusation of wholesale falsehood and misrepresentation on our part, to the "judgment and consequent condemnation" of our readers, who will no doubt think that a little more "low temperature" in the letter would have been rather more dignified. The term "so-called" will be noted with interest and relish by "exploiters of other low-temperature processes," who may, or may not, repose great faith in the opinions of a Company with such prolonged experience of both low-temperature carbonization and of wrecked hopes.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Travancore Monazite Deposits.

Mr. FELL asked the Secretary of State for India if the German element which lately controlled the deposits of monazite, necessary for the gas-mantle industry, in Travancore (South India) has now been completely eliminated; what has been done with the preference shares and 11,000 ordinary shares of the Travancore Minerals Company formerly belonging to the Auer Company of Berlin; and if the Germans charged mantle manufacturers here £36 a ton for the sand which cost about £4 a ton?

Mr. CHAMBERLAIN: The German element in the Travancore Minerals Company, Limited, has been eliminated. The preference and ordinary shares formerly held on behalf of the Auer Company, of Berlin, have been purchased by the Travancore Minerals Company itself from the Public Trustee. I am not aware of the prices quoted to British mantle manufacturers for monazite sand; but I understand that before the war the consumption of the raw material was restricted almost entirely to Germany. The Company have now given a formal undertaking that they will be ready at all times to sell the sand direct and at a fair price to any *bonâ fide* British firm who may desire to purchase in reasonable quantities for the purposes of manufacture.

British Incandescent Mantle Works.

Sir R. COOPER asked the President of the Board of Trade if the shares of the British Incandescent Mantle Works, Limited, all of which except five out of a capital of £30,000 are held by enemy aliens, will be sold by public or private treaty; and will the purchaser in either case be required to make statutory declaration of nationality and interest?

Mr. PRETYMAN: As it was not found practicable to deal with the British Incandescent Mantle Works, Limited, by selling the shares held by enemies, an order was made requiring the business to be wound up; and it will be sold in the liquidation. Conditions as to the nationality of the purchasers will be imposed.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 8.]

Nos. 15,420—15,813.

BAYLISS, T. P.—"Making tight joints in gas, &c., pipes." No. 15,528.

BOSTAPH ENGINEERING COMPANY and BOSTAPH, H. P.—"Retort." No. 15,477.

BOSTAPH ENGINEERING COMPANY and BOSTAPH, H. P.—"Obtaining coke and bye-products from coal." No. 15,478.

BUSHER, J.—"Boxes for inverted mantles." No. 15,715.

DOWSON AND MASON GAS PLANT COMPANY.—"Sand-sealed gas, &c., dampers." No. 15,496.

HALL, I.—"Liquid-fuel burners and furnaces." No. 15,563.

MARKHAM, J.—See Bayliss. No. 15,528.

MOORE, T. G.—"Giving warning when gas pressure is reduced." No. 15,773.

SCHUELER, G. R.—"Pumping, exhausting, and blowing plant." No. 15,559.

SPARKS, C. H.—"Socket connections for pipes." No. 15,683.

SVENSKA AKTIEBOLAGET GASACCUMULATOR.—"Incandescent gas-lamps." No. 15,458.

THOMAS, W.—"Distilling coal and wood." No. 15,450.

THORP, H. T.—"Control of objects at a distance." No. 15,426.

TINKER, F.—"Purification of oil gases." No. 15,785.

WRIGHT, T.—See Dowson and Mason Gas Plant Company. No. 15,496.

Modified Lighting in Wandsworth.—The Highways Committee of the Wandsworth Borough Council, reporting as to street lighting in view of air-raids, state that they understand experiments are now being carried out with a new metal device which has been made for masking the street-lamps, so as to reduce the light thrown upon the ground in the vicinity of the lamp columns; but as the effect of this device is still the subject of observations by the Government Departments, the Committee do not see their way to recommend its adoption at the present moment. Accordingly, they have made arrangements for all the lamps now in use in the borough to have the lower portions of the lanterns covered with one coat of distemper

LEGAL INTELLIGENCE.

MANCHESTER GAS DEPARTMENT SUMMONED.

Alleged Breach of Statutory Obligations.

At the Manchester City Police Court, last Wednesday, before the STIPENDIARY MAGISTRATE (Mr. E. Brierley), James Lowe, a tenant of certain offices in Bull's Head Chambers, Market Place, Manchester, summoned the Lord Mayor, aldermen, and citizens "for on Oct. 12, 1916, being then undertakers for the supply of gas, did unlawfully fail, upon being required to do so by James Lowe, to give, and continue to give, a supply of gas for such premises."

Mr. BROADSMITH (representing the complainant) said the summons was issued under section 11 of the Gas-Works' Clauses Act, 1871. The complainant had at his offices a slot meter for the supply of gas. The facts were, he believed, that the Corporation Gas Department refused to give Mr. Lowe a supply of gas on the ground that the sum of 24s. 2d. was owing in respect of gas previously supplied to the premises.

Complainant, in his evidence, said he was the tenant of the premises referred to, and as such he made application to the Gas Department for a supply of gas to a prepayment meter on April 13 and Oct. 12. He had also attempted to interview the Superintendent (Mr. Frederick A. Price), but had been unsuccessful.

Mr. PERCY M. HEATH, the Deputy Town Clerk, who defended, said he should require the complainant to prove that the application referred to was properly served upon the undertakers at their office, and that it complied in all respects with the Act of 1871.

In reply to the STIPENDIARY, complainant said he did not post the letter of April 12. He himself handed it in at the Gas Offices.

Mr. BROADSMITH put in a letter from Mr. Price to the complainant dated April 17. This referred to the outstanding account of 24s. 2d., which the complainant contended was caused by a leakage in the slot meter, and for which he was not liable.

Mr. HEATH said he should not question the complainant's statement as to having made applications for a gas supply, but he should submit that the application dated April 13 was not a proper one.

In reply to Mr. HEATH, the complainant said he had occupied offices in Bull's Head Chambers for the last fourteen years, but had only been the tenant fifteen months. He denied that he informed the Superintendent of the Gas Department on April 1, 1916, that he was not the tenant on Sept. 29, 1915, or that he had told inspectors that his tenancy did not commence until some time in 1916. The statement in his Solicitors' letter, that he took over the premises on March 23, 1916, was erroneous. He had not instructed them to say it. He denied that when the Inspector Turner visited the premises on Dec. 29, 1915, it was found (according to the meter-index) that 4500 cubic feet of gas had been consumed (12s. 6d.), and that instead of this amount being in the cash-box there was only 5s. 3d. He also denied that an authorized plumber named Phillips had made repeated attempts between Dec. 30, 1915, and Feb. 2, 1916, to enter the premises for the purpose of removing the meter to test it. He admitted, however, that he had met the plumber in the passage leading to his office. He admitted, also, that he was using gas in the offices from Dec. 29, 1915, to Feb. 2, 1916, and could not account for no money being in the cash-box, although 11s. 8d. should have been in it. From Feb. 2, 1916, to March 23, 1916, the meter recorded accurately, and the money found in the box when the collector called later was correct.

In reply to the MAGISTRATE, complainant said he made no allegations against anybody; his point was that the gas had not been consumed by him. He objected to pay for leakages or escapes.

The STIPENDIARY said that, whether there was any defect in the meter or not, the fact remained that from Feb. 2 to March 23 it registered correctly, for the proper amount was found in the cash-box.

In further reply to Mr. HEATH complainant admitted writing to the Superintendent of the Gas Department on April 16, 1916, returning the account for 24s. 2d., stating that he had only recently become tenant of the premises, and that the gas used through the automatic meter must have been consumed by the previous tenants,

The STIPENDIARY said there was no complaint of escapes of gas in the letter.

Mr. HEATH, addressing the Stipendiary, submitted that the letter of April 13, 1916, was not a proper notice under section 11 of the Gas-Works Clauses Act, 1871. It did not specify the premises in respect of which the supply was required, nor did it name the day upon which the supply was to commence.

The STIPENDIARY asked if the supply previously given by the Corporation did not waive the notice under section 11 of the Act.

Mr. HEATH replied that the Corporation were being charged with a breach of a statutory obligation. If the preliminary requirements of the Statute which brought this obligation into existence had not been complied with, the statutory obligation could not arise; and therefore they could not be liable for breach of obligation. He submitted that, the statutory obligation not having been complied with, the matter was one of sale and supply, and the ordinary contractual rights of the parties came into existence. The person receiving the supply of gas having failed to pay for it, the Corporation were not prepared to continue the supply.

The STIPENDIARY asked whether there was not some provision in the Gas-Works' Clauses Acts which authorized the Corporation to cut off the supply.

Mr. HEATH replied that, under section 16 of the 1847 Act, if a person supplied with gas neglected to pay, "the gas undertakers may stop the gas from entering the premises of such person by cutting off the service-pipe or by such means as the gas undertakers shall think fit." He submitted he had no case to answer.

The STIPENDIARY asked whether Mr. Heath had any remarks to offer concerning complainant's statement that the meter might have leaked or inaccurately recorded the gas consumed.

Mr. HEATH said that section 20 of the Act of 1871 provided that the

register of the meter was to be taken as *primâ facie* evidence of the quantity of gas consumed.

The STIPENDIARY said that the complainant had failed to make out his case. He had not proved the service of a proper notice upon the defendants, specifying the premises in respect of which the supply was required and the date on which the supply was required to commence. This being so, the statutory obligation of the Corporation to supply the gas did not arise. Even assuming that the notice was a good one, the complainant had himself admitted that he owed money to the Corporation for the supply of gas prior to April 13, 1916, and that he had not paid it. The Corporation therefore exercised their statutory rights of cutting off the supply. Assuming the supply was not given under the Statute, it was one of contract, Therefore the summons would be dismissed, with costs.

Embezzlement Charge at Teignmouth.

At the Devon Assizes at Exeter, on Monday of last week, Norman M. Johnson was sentenced to six months' hard labour for embezzling various sums received by him on account of his employers, the Teignmouth Urban District Council. Prisoner, who was formerly a clerk at the gas-works, was appointed in September, 1913, slot-meter collector and inspector. Two months ago, Mr. J. A. Gray (the Manager of the gas-works) made an examination of Johnson's books; and, in consequence of what was discovered, the man was suspended. In the result, six charges of embezzlement were preferred against him. In one case, he made no return at all of moneys paid him; and in another case, he falsified both the entry in his book and the figure showing the gas consumed. Mr. Justice Rowlatt told the accused that, but for his having joined the Colours, he would have given him a longer term of imprisonment.

Fine for Stealing Gas.

William Gunn was last week fined £5 by the Eastbourne Magistrates on a summons for stealing gas and also for preventing gas passing through the meter. Mr. H. H. Coles, for the Gas Company, said the offences were committed between Oct. 21 and 24. On an inspection of defendant's meter, it was found that the consumption for the quarter was shown to have been 2400 cubic feet; whereas the Secretary (Mr. J. S. Garrard) was of opinion that it ought to have been about 5000 feet. Defendant subsequently admitted disconnecting the meter, thereby committing a technical breach of the Company's regulations, and offered to pay £2 to the hospital as compensation. Giving evidence, defendant said he had had electric light installed, and this reduced his gas consumption. On Sunday, Oct. 22, they could not get sufficient gas to cook the dinner, so he disconnected the meter and inserted a pipe. The gas was used for about two hours. Defendant told his wife not to use the gas again, as he would call at the Company's offices and get the meter seen to. However, he forgot to call. In disconnecting the meter he did a foolish thing; but he had no felonious intention.

Accident Arising from an Extinguished Lamp.

Sitting last Tuesday in the Nisi Prius Court at Liverpool Assizes, Mr. Justice Kennedy gave judgment, with leave to appeal (in view of the fact that the points raised were important and contentious), in the action *Todd v. St. Helens Corporation*. Plaintiff claimed for personal injuries through a fall over a "trap" of misplaced tiles at the entrance to a public convenience, of which the lamp had been extinguished under the restricted lighting order; and the Special Jury had found for him, with damages £48. The facts were that William Todd, a gas worker, of St. Helens, fell down fifteen steps and sustained a fracture of the arm, which kept him idle for sixteen weeks. His Lordship, in giving judgment for plaintiff, held that he was in the position of an invitee, and that the defendant Corporation were bound, so long as they chose to maintain the convenience, to keep it in good condition. In obeying a statutory order to darken the lamp, they could either have closed the convenience or have substituted an interior light. He granted a stay of execution for fourteen days.

Gas Undertakings as Certified Works.

Exception was taken at a meeting of the Ossett Town Council, by Mr. J. T. Peace, to a resolution of the Gas Committee to apply to the Ministry of Munitions for the gas-works to be placed on the list of certified works. He contended that if the workmen neglected their work the common law provided a remedy; but he alleged that the management was too weak to use it. His idea was that if a man would not work he must fight; but as placing the works on the certified list would apply to good workmen as well as bad, he contended that they should first be consulted. It was pointed out that there was no question of wages involved; the rate paid being as high as at other gas-works in the district. Mr. J. T. Marsden defended the minutes, and said that if men broke time merely through loose habits means must be adopted to compel them to work. Alderman Robinson (the Chairman of the Committee) expressed the view that to take men before a Munitions Tribunal was less drastic than to take them before the Magistrates. Why should the men be consulted? Every conciliatory means had been tried to get them to work. The works were already understaffed; and only the previous day nine men were away. The Manager never knew what staff he had. An amendment to refer the matter back to the Committee was defeated; and the minutes were approved.

Diminutive Gas Account at Heywood.—One of several defendants summoned at the Heywood Police Court last week for an infraction of the Defence of the Realm lighting regulations, told Alderman Healey, J.P. (Chairman of the Gas Department), who presided on the Bench, that he was not guilty of the offence alleged against him, "because he made it a practice to burn very little gas—his bill for the September quarter being only 8d." He alleged that he never had any lights in his shop. In fining defendant 5s., Alderman Healey said he thought the meter wanted looking after.

MISCELLANEOUS NEWS.

THE DUBLIN ELECTRICITY UNDERTAKING.

Severe Strictures by an Investigating Expert.

Official publication has now been made of the report of the Special Committee appointed by the Dublin Corporation to investigate the administration of the electricity undertaking, the prices charged for light and power, and other matters relating thereto. The Committee submit the report of the Consulting and Inspecting Engineer whom they called in (Mr. P. Walter D'Alton); the replies to his comments and strictures by the City Electrical Engineer, Mr. Mark Ruddle; Mr. D'Alton's supplementary report; and a recommendation by the Committee that Mr. D'Alton be asked upon what terms and conditions he would undertake entire management of the electricity undertaking for a period of three years.

In his first report, Mr. D'Alton said that the selection of the Pigeon House for the site of the generating station could not be justified. It was a mistake of great magnitude, and one for which the economy of the undertaking must suffer throughout its existence. Among other things, this station had raised the cost of the generated and sold units by the charges against revenue, and upon capital in the losses in transmission, and by the duplication of centres of control and of staff. The inaccessibility of the Pigeon House is emphasized. In regard to prices, the report points to a table of fourteen undertakings having a sale of 6 million units for private and public supply only (no traction supply), of which Dublin was the highest at 2·66d., while its load factor was by far the lowest. For private supply alone, the average was 1·8d.; Dublin was the highest at 2·86d. For public lighting, the mean price received was 1·47d. The Dublin figure was returned at 1·71d., which was exceeded in certain English centres.

Mr. D'Alton's conclusions were that the administration was unduly complicated by dual control; that the charges for energy, while not unreasonable for public lighting, were unduly high for private supply; that considerable reductions in the number of workmen employed at the Pigeon House were possible, and would follow upon the greater use of modern machinery; that salaries and wages in the lighting department were out of proportion, amounting to over 16 per cent. of the gas revenue in the public section; and that the cost of the secretarial department was too high. The coal supply required overhauling, as it seemed now to have become a monopoly. Some of the plant was condemned as obsolete; and figures were given showing heavy losses between units generated and sold.

GAS COMPANY'S PRICES.

In his supplementary report, Mr. D'Alton dealt with the replies of Mr. Ruddle and other officials in defence of their respective departments. On the matter of prices, he observes: The question of the relative price of gas in other places does not appear to me to be of the first importance. It is only a guiding question, a commercial one, and should not be too strongly used to base any serious argument upon. The fact of high price of gas ought to have been a factor for the Electricity Department to popularize electricity for lighting, for heating, and for cooking. The department seems to have regarded the price of gas as a standard for competition, and have merely set themselves the problem of seeing how near to that price they dared to go. I am told that the Gas Company have revived in a remarkable manner during the last year or two; so that they were able to pay last year the maximum dividend allowed by Act, and to offer some users of electricity such terms as to induce them to put down town gas-engines, and let their motors stand idle. I learn of a recent and specific case in which a 30-H.P. gas-engine has been put down to supersede a suction gas plant and some electric motors; and the consumer gets a contract from the Company which obviously pays him, while a three years' agreement relieves him of any anxiety about increase of price within that time, with at least a reasonable prospect of reduction at its conclusion, by which time it may be hoped the prejudicial effects on costs of the war may have moderated. This may, of course, be an isolated case. I have not had time or opportunity to investigate the doings of the Company. But it goes to show, at any rate, that the Gas Company, by adopting a strong forward policy, can secure business.

Whatever justification there may be for raising prices consequent upon war conditions, the pre-war rates are held by Mr. D'Alton to be too high. A power rate of 1½d. may have had some attractions for the small user with a small load factor; but it could not be considered equally attractive to the heavy users with a good load factor. Heating and cooking at 1½d., except for curling-irons and toast, is, he says, frankly impossible. Mr. D'Alton is unable to modify his previous statements on various aspects of the undertaking, including plant utility and coal consumption; declares in favour of the turbine as against other types of engines; and expresses his conviction that such an undertaking should be administered by an engineer, and that the presence of two chiefs—a commercial manager and an engineer—cannot be for its good.

CHALLENGE TO THE "MULTICOOKER."

The Action of the British Commercial Gas Association.

The claims made on behalf of the "Multicooker" were, it will be remembered, the subject of remark by Mr. George Helps at the annual general meeting of the British Commercial Gas Association; and, in reply, Mr. F. W. Goodenough informed the members that the Executive Committee had approved of a letter to be sent to "Truth," which had already published some information respecting the apparatus, definitely challenging the "Multicooker" people to make good their claims

by a public test. Last Wednesday's issue of "Truth" contained the letter, together with the following remarks by "Scrutator."

THE MERITS OF THE MULTICOOKER.

I have received the following letter from the British Commercial Gas Association, in reply to a letter from Mr. T. Bench, the Director of Multicooker Inventions, Limited, which appeared in "Truth" of Oct. 18. The Association evidently recognize the force of my suggestion that the best way of settling the question as to the merits of the "Multicooker" as a gas saver and the correctness of the assertion that its use reduces the gas bill by 75 per cent. would be by open competition; and the conditions which they propose for the carrying out of such a competition seem to my mind equitable, and calculated to determine justly the points at issue. Accordingly, I am quite prepared to act as stakeholder, to appoint an unprejudiced umpire, and to publish the result of the tests. It remains for Mr. Bench and his co-Directors to say whether they will accept the challenge. If they can justify the statements made in the "Multicooker" advertisements, they will not only earn £500 for the Red Cross Society, but obtain an advertisement which will be worth a good deal more than £500 for their Company. If they refuse to accept the challenge, they must expect the public to draw an unfavourable conclusion.

The British Commercial Gas Association,
47, Victoria Street, Westminster, S.W.,
Nov. 4, 1916.

The attention of my Committee has been drawn to a letter from the Director of Multicooker Inventions, Limited, in which he criticizes the tests published by you* of claims made in advertisements of the "Multicooker."

The tests in question were, as you are aware, made by experts employed by this Association, with a view to ascertaining if the "Multicooker" was an appliance which gas managers could recommend to their consumers as an economical gas-cooker. Gas managers knew that the claim to save 75 per cent. of the gas bill was absurd, but hoped to find that a real advance in gas-cooker efficiency had been made, as, contrary to the suggestion made by your correspondent, gas managers are always seeking for the most economical appliances to recommend to their customers, well knowing that all permanently profitable business is based upon the satisfaction of the customer. Of this statement ample evidence can be produced. The results of the tests, made most carefully and thoroughly, showed that this hope, like "the 75 per cent. saving" claim, was quite unfounded.

As those tests are now called in question by the "Multicooker" makers—who recently declined an opportunity to prove their claims by tests to be conducted in the presence of independent third parties—I am instructed to issue the following challenge to them.

Menus to be drawn up by the Food and Cookery Association for the complete meals for a week for (*a*) a family of three persons and one servant, and (*b*) a family of five persons and two servants, with complete schedules of the quantities of foods to be cooked and of water required for washing-up.

These meals to be cooked in public (*a*) on a "Multicooker" by a representative of the makers, and (*b*) by a representative of this Association on a gas-cooker to be obtained on hire from many gas companies, of which over 20,000 are guaranteed to be in use in the district of the Gas Light and Coke Company alone.

The quantities of food to be cooked and water to be heated to be measured and weighed, and the quantities of gas consumed (as recorded by meters tested and certified as correct by the London County Council) to be recorded by two observers to be selected, one by the makers of the "Multicooker," and one by this Association.

The proper cooking of the food and the heating of the water to be tested and certified by an observer appointed by the Food and Cookery Association. The whole of the tests and observations to be carried out in the presence of an Umpire appointed by the Editor of "Truth," whose decision upon any question in dispute shall be final.

If the quantities of gas required for cooking the food and heating the water for washing up—in other words, the kitchen gas bills—in the case of the "Multicooker" show a saving of 75 per cent. (or closely thereto), as compared with those required in the case of the gas-cooker let on hire by the gas companies, this Association will pay to the British Red Cross Society the sum of £500, and bear all the cost of the tests.

If the "Multicooker" gas consumption exceeds 75 per cent. of the hired cooker's consumption—*i.e.*, shows only one-third of the saving claimed for it—Multicooker Inventions, Limited, to pay £250 to the British Red Cross Society, and the expenses of the test; and if the tests show that the "Multicooker" effects no saving at all in the kitchen gas bill, the makers to pay £500 to the British Red Cross Society, and bear all expenses.

£500 to be deposited by both parties in the hands of the Editor of "Truth," and his decision to be accepted as final and binding by both parties.

If the challenge is accepted, arrangements shall be made for the tests at the earliest possible date.—Yours faithfully,

W. M. MASON, Secretary.

* See "JOURNAL" for Aug. 1 last, p. 217.

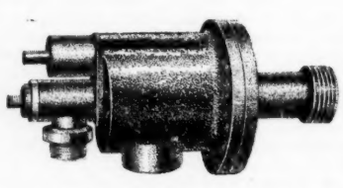
COAL GAS FOR ROAD TRACTION.

The "Commercial Motor" continues to urge attention to the claims of coal gas—"the best of home-produced fuels." In their issue for the 2nd inst., there are to be found the results of some comparative power tests on unaltered petrol engines, carried out at works at Guildford.

After remarking that they have authority for stating that anything from 70 per cent. upwards, of relative efficiency, expressed in the percentage of horse power on coal gas to the maximum horse power on petrol, can be expected from any modern petrol engine, without alteration, as a minimum, our contemporary draws attention to a device which permits of the use of coal gas for part of a long journey, and petrol for the remainder. The writer then proceeds: "The storage problem is not a simple one. Later on, no doubt, gas undertakings in different parts of the country will instal storage for coal gas at reasonable pressures, (say) anything between 150 lbs. and 300 lbs. to the square inch, at their depôts. The Directors of the Gas Light and Coke Company are about to do this; and we have had pleasure in talking over the details with one of the Company's experts at Horseferry Road. We may mention, incidentally, that the Company are

Gas Furnaces

BURNERS



The DAVIS Patent Air-Blast Burner.

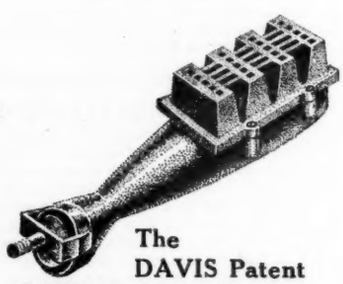
This Burner is particularly suitable for operations requiring very high temperatures or great concentration of heat. The gas and air adjustments are readily manipulated, whilst the intimate association of the mixture, essential for complete utilization of the air pressure, is ensured by the patent construction.

Made in 4 sizes.

The DAVIS Patent High-Power Ring Burner.

The feature of this Burner is a special mixing grating, interposed between the gas supply and the flame holes. This atomizing arrangement ensures the intimate association of a large proportion of air with the gas, resulting in exceptionally high-flame temperatures at ordinary main pressure.

Made in 3 sizes for high or low pressure gas.



The DAVIS Patent Self-Intensifying Burner.

Generates a highly aerated and intimately associated admixture, the patent mixing grating providing also a means of pre-heating the secondary air necessary to support combustion. By this means the heat of the flames is considerably intensified, and furnace temperature maintained with a correspondingly reduced gas rate.

Made in 3 types and many sizes for high or low-pressure gas.

The Davis Furnace Company (Proprietors: The Davis Gas Stove Co., Ltd.)
Heating Engineers and Fuel Specialists: Diamond Foundry, Luton.

converting two of their heavy commercial vehicles to run on coal gas, and are having the necessary storage cylinders on the vehicles, in part relying upon an improvization which includes the adaptation of certain gas-cylinders from the Great Western Railway Company, and in part upon new gasholders from the Steel Barrel Company, of Uxbridge. When there is storage under pressure at a depôt, it is only a matter of a couple of minutes to refill the storage vessels, which are on the vehicle. We are in a position to summarize the following proved equivalents for coal gas, as compared with petrol: Maximum of 330 cubic feet of coal gas equals a gallon of petrol, and this may fall to 270 cubic feet if the gas is not stripped of benzol; a consumption varying between 28 and 22 cubic feet per horse-power-hour, according to the strength of the gas, compared with (say) 0·75 to 0·65 pint of petrol, according to load on the engine; coal gas at 3s. per 1000 cubic feet is equal to petrol at not more than 1s. per gallon; a petrol vehicle, if loaded with 3 tons of goods, and if running on coal gas, will require anything between 45 and 22 cubic feet per mile run, according to state of roads, gradients, and wind resistance. It should also be mentioned that coal gas is a wonderfully clean fuel. There is no trouble from carbon deposit when using it."

In the same issue of the "Commercial Motor," there appears the following letter from Mr. A. E. Broadberry, to which is appended the editorial note: "We are pleased to observe that the President of the Institution of Gas Engineers and his colleagues dissociate themselves from those who scoff at the idea of the commercial use of coal gas for road-traction purposes."

Sir,—As President of the Institution of Gas Engineers, I feel that I must disavow on behalf of that body of professional gentlemen the suggestion that they, as a body, have scoffed at the idea of it being possible to use coal gas in petrol engines. Of course, they all know that coal gas is a most suitable fuel for the engine. The only difficulty is the matter of carrying a sufficient quantity on a vehicle to enable it to run a considerable distance.

When it was first suggested that compressed coal gas might be used on motor-cars, including the touring type, they did scoff at the idea of loading a touring car with nearly a ton weight of cylinders to enable it to run 40 or 50 miles. Not only was there the disadvantage of the extra weight, but the bulk also was difficult to accommodate on an ordinary touring car.

The weight and bulk difficulty are certainly very much less when considered in connection with the commercial type of vehicle; but still, at 150 lbs. pressure, which you suggest, the bulk for 1000 cubic feet of compressed gas is fairly considerable, though the difficulty is not insurmountable.

This Company at the present time are arranging to carry out some experiments in connection with the British Commercial Gas Association; and at a later date the results will be available for your publication.

When the principle of gas-driven vehicles is applied to a tramway, the matter becomes very simple, as charging stations can be arranged at each end of the track, or, if necessary, at convenient intervals, so that the cylinders need not be at all large for containing the necessary gas to run from point to point.

A. E. Broadberry, M.Inst.C.E.,
Chief Engineer and General Manager,
Tottenham District Light, Heat, and Power Company.

DUAL CONTRACTS FOR PUBLIC LIGHTING.

A Three-Sided Dispute.

A curious state of affairs has arisen in connection with the public lighting at Newark, N.J., which has resulted in the Public Service Gas Company in the city applying to the State Court of Chancery for an injunction to restrain the City Council or the Public Lighting Service Corporation from taking a supply of gas from mains or services belonging to the Company, except in conjunction with the average meter system. As the similarity of title may lead to some confusion, it must be explained at the outset that the Public Service Gas Company are a local concern having the sole right to supply gas in the district, and that the Public Lighting Service Corporation is a New York enterprise established for the purposes of manufacturing, furnishing, lighting, and extinguishing gas-lamps for public lighting in any locality or district, but has no franchise for the manufacture or supply of gas. Its operations are confined to appliances.

A six years' contract for the public lighting, made between the City Council and the Gas Company, which apparently included everything apart from the supply of columns, came to an end in March, 1916. The City then solicited, by advertisement, two separate proposals: (1) For the supply, maintenance, lighting, and extinguishing of about 2000 lanterns and burners; and (2) for the supply of gas to the same. The Gas Company submitted a proposal based on the terms of the previous contract; but the City Council rejected it as not being in compliance with the conditions of the advertisement. About May 15 they accepted a tender from the co-defendants, for the equipment of the 2000 columns with lanterns, burners, and accessories, and for maintaining, lighting, and extinguishing the same over a period of three years, according a scheduled time table. The scheme included taking a supply of gas from the existing service-pipes; the price per 1000 cubic feet to be based on the schedule filed by the Gas Company with the State Board of Utility Commissioners. The quantity consumed was to be arrived at by multiplying the number of lights by the scheduled hours of burning, and an average hourly consumption per burner as estimated by the co-defendants, who claimed to own a make of governor that would ensure a uniform gas consumption, under pressures ranging from 15-10ths to 60-10ths of an inch of water, that was as accurate as an average street-lamp meter, and that did, in fact, constitute, and was the same as, a reliable make of meter.

On June 5, the City authorities directed the Gas Company to remove forthwith their lanterns and burners from the columns, to admit of the installation under the contract with the co-defendants. The Gas Company replied by a formal objection to the new installation, and to the use of their gas in connection with the same, except in conjunction with an approved average meter system. No notice was taken of this; and on June 15 the complainants received a second notification from the City Engineer, desiring them to dismantle about 200 columns, and if they desired that the gas should be metered, to immediately instal

The "Fire Queen"

The Latest "Main" Gas Fire.

It is designed to co-ordinate in size with *any* modern Interior Grate.

The fire backs and heights over-all are graded to coincide with the dimensions of Standard Grates. Note the appearance when in use. So like a bright coal fire, and it will pass all the "tests" for Efficiency and Ventilation.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

meters on the services connected to the said columns at their own expense. The Gas Company repeated their previous objection. The next day the co-defendants dismantled about 50 lamps as a commencement; and it was understood that they intended to proceed on the terms of their contract, and that the gas would be paid for on the basis of an estimated hourly consumption of 3·3 cubic feet per burner, the scheduled time table, and the registered price of gas.

The complainants alleged several reasons why the gas could not be accurately measured under the proposed system. There would be variations in pressure in different parts of the district according to altitude, distance from the source of supply, and the local and general demands of private consumers from hour to hour. The openings in the burners, through which the gas escaped, were liable to be partially choked by dust or deposit of carbon, or to be enlarged by corrosion or by pricking out. The Company would have no control over the actual hours of lighting, and as 2000 lamps could not be lighted or extinguished instantaneously, the hours of consumption would be subject to variation from night to night. There was no method by which the consumption of gas could be fairly ascertained except the average meter system; and there were no practical means of installing meters on or near the existing columns.

Quoting previous cases as precedents, the Court held that the complainants were by the terms of their franchise under obligation to supply gas to the Municipality or to private individuals, but also that the right to demand a supply was subject to a fair price and other reasonable terms. If the price proposed was considered unfair or unreasonable, the City had its remedies—either by mandamus if the supply was not yet commenced, or in equity for injunction in connection with existing supplies. The City claimed that the complainants were bound to furnish gas, and to accept the co-defendants records as a fair indication of the quantity consumed, based on an estimated hour-consumption of 3·3 cubic feet per burner. The real question in the case was whether these terms were fair and reasonable; whether the complainants should accept the basis of 3·3 cubic feet per hour, and check the number of hours usages by means of an adequate staff of inspectors; or, as an alternative, whether they were bound to supply meters at their own expense.

The City could not compel the acceptance of their terms, as the method proposed did not with reasonable accuracy ascertain the quantity of gas consumed; and the complainants were not bound to incur the expense of meters or of a staff of inspectors, unless adequately compensated for the same. The defendants were therefore restrained from taking or using gas from pipes belonging to the complainants until the final hearing of the case, except in conjunction with the average meter system. There was no evidence that the complainants were not ready and willing to supply gas either to the City or to the Lighting Corporation, if properly paid for the same, or that they were not prepared to enter into a contract on the terms usual in other districts where the dual contract system in connection with public lighting was in force.

NOTES FROM SCOTLAND.

The Late Sir William Ramsay.—There is a movement on foot in Glasgow, headed by an influential Committee, to establish a memorial in connection with the University to the late Sir William Ramsay. In consideration of the exceptional circumstances of the present time, it has been arranged that individual subscriptions should not exceed £2 2s. The Committee, in a circular which they are issuing, state that, while the best-known part of Sir William Ramsay's work was done while he was Professor of Chemistry in University College, London, it seemed to them that Glasgow should have some memorial of his scientific achievements and his world-wide fame, and that the proposal to provide such a memorial would appeal to all connected with the school and University in which he was trained, and also to all interested in science and its application to industry. Sir William Ramsay was born in Glasgow, and was educated at Glasgow Academy and Glasgow University. Early in his career, he acted as assistant to the Professors of Chemistry both in Anderton's College and in the University.

Stair Lighting Case in the House of Lords.—The House of Lords have had under consideration the case in which Mrs. Janet Beattie sued the Corporation of Glasgow for damages on account of injuries which she alleged were caused to her owing to lack of lighting in a common stair in a tenement in Broad Street. Mrs. Beattie, in her action, contended that there was a statutory duty on the part of the Corporation to have the gas lighted on common stairs; and it was upon the alleged failure to do so on the particular occasion that she received her injuries that the action was based. The Corporation submitted that the action did not lie, as they contended that section 361 of the Glasgow Police Act, 1866, the statutory provision in question, did not imply a warrant as to the lighting of individual lamps. Lord Anderson decided that there was an issue on which to go to a jury; and his finding was upheld unanimously by the Second Division of the Court of Session. Against this finding, an appeal was taken to the House of Lords. It was there submitted by Mr. Scanlan, on behalf of Mrs. Beattie, that by a Statute of 1808 regulating appeals on interlocutory proceedings, the appeal to the House of Lords on the point of issue was prohibited. After hearing Counsel for the Corporation, the House unanimously came to the conclusion that they could not hear the appeal. It was accordingly dismissed, and the action may now be tried before a jury, as Lord Anderson decided.

Perth and its Borrowing Powers.—Last Thursday there were submitted to a special meeting of the Perth Town Council the gas accounts for the past year and the Auditor's report thereon, which, as Bailie Beaton remarked, contained some things which required explanation. It was stated, for instance, that the borrowing powers of the Council in the gas department had been exceeded by over £12,000, and that on May 15 last there was a bank overdraft of over £9000. This, he thought, should not go out to the public as being correct; and he considered

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Made in three sizes:—10, 20, and 40 gallons.

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ACME WORKS,
BIRMINGHAM.

the Convener of the Gas Committee should make an explanation. Ex-Bailie Wright, the Convener, said that, for ordinary purposes, the gas department were entitled to borrow to the extent of two-thirds of their income. Last May they required to repay all money they had borrowed during the year, and, while they had large stocks in hand, they expected to get sufficient money to repay all they had borrowed. It was practically a book entry. At the present time the finances of the gas department were as good as they had been for a long period of years.

A General Demand for Increased Wages at Kirkcaldy.—At a meeting last week of the Wages Committee of the Kirkcaldy Town Council, applications for increases of wages were submitted by the roadmen, police, tramway and electric light employees, gas workers, and fire-brigade employees. After consideration, it was agreed to recommend that the roadmen and police each receive an increase of 2s. per week and to remit the applications of the other employees to the officials of the respective departments to arrange with the men.

Street Openings in Banff.—At a recent meeting of the Banff Town Council, the Clerk submitted correspondence with the Gas Company with reference to street openings. In his letter to the Company, he pointed out that the roads should not be opened except at the instance of the Surveyor, and that when opened they should be reinstated in the condition in which they were before being opened by the Company. Further, that, as certain openings of the streets recently made by the Company had not been properly filled in, the Council would not be responsible for any accident that occurred through these parts of the streets being left in an unsatisfactory condition. In reply, the Company wrote that instructions had been given to the Manager to apply to the Surveyor for permission before opening the streets. Provost Rankine said his idea was that the Company should ask leave first, and before leaving the job they should get a certificate from the Surveyor that the streets were in order. Bailie Taylor suggested that they should appoint the Provost and the Conveners of the Roads and Lighting Committees to make an arrangement with the Gas Company, and this was agreed to.

Huddersfield Gas Undertaking.—The departmental reports on the past year, included in the retiring Mayor's statement at Huddersfield, showed that the gas sold during the year ended March, 1916, amounted to 880,000,000 cubic feet, which was 0·45 per cent. less than the output of the previous year. The reduction was, however, more than accounted for by the reduced street lighting. The year's income was £124,040, and the expenditure £109,135 (including £586 allowances to men on service), leaving a trading profit of £14,905, and a surplus of £1717 after allowing for interest and sinking fund. There was an increase of 25,000,000 cubic feet in the sale of gas for cooking, heating, and industrial uses. The gas consumed through prepayment meters increased by 11,000,000 cubic feet; the collections having amounted to £38,213.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 13.

There is a fair demand for pitch for home trade, and a very good inquiry for export. High freights and the scarcity of boats still operate to impede export business; the value of pitch remaining at 21s. net per ton f.o.b. works. Creosote is in a very steady position. Large quantities of this material are being employed for liquid fuel purposes in this country, which has the advantage of being a home use for a British product. The effect will be a great reduction in the shipments to America, and the freeing of steamer room for other purposes. The value of creosote is about 4d. net per gallon in bulk at makers' works. Solvent naphtha and other products are in good demand at the last prices.

Sulphate of ammonia is firm, and there are many inquiries from allied countries in the market. The value is unchanged at £17 12s. 6d. net per ton for 25 per cent. quality for prompt delivery.

Tar Products in the Provinces.

Nov. 11.

There is nothing new to report concerning the markets for tar products. Business in pitch is still very difficult. Solvent naphtha is quiet; but the price of it remains steady. Creosote has maintained its price.

The average values of gas-works products during the past week were: Gas-works coal tar, 17s. to 21s. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2½d. to 2⅝d. Heavy oils, in bulk, North, 3d. to 3¼d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2¾d. to 3d. per unit; "B," ¾d. to 1d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Nov.* 11.

There has been a strong market all through the week, and available supplies have been keenly competed for, especially for delivery beyond November. A large inquiry has come from abroad, which it has been difficult to meet under present circumstances. The nearest prompt values are now £18 per ton f.o.b. Hull, £18 2s. 6d. f.o.b. Liverpool,

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and £18 5s. f.o.b. Leith. For delivery next year, it is reported that £18 10s. has been paid for January-June and £18 5s. for July-December, at the best ports.

Nitrate of Soda.

This market has become firmer, and 17s. 10½d. per cwt. for ordinary quality and 18s. 4½d. for refined are now required on spot.

Sulphate of Ammonia.

From another source it is stated that to-day's quotations are as follows: Outside London makes, £16 15s.; Hull, £17 12s. 6d.; Leith, £17 17s. 6d.; Liverpool, £17 15s. Middlesbrough, £17 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade shows a brisk demand; but the supply of steamers is inadequate. Shipments are therefore restricted at some of the ports, and prices are affected, as sellers will sometimes make concessions when the buyer can give prompt steamers; and there is the further fact that our chief Allies have now supplies at "controlled" prices. In the steam coal trade, the demand is fair; but the scarcity of steamers affects the price. Best Northumbrians are about 30s. per ton f.o.b., second-class are quoted about 27s. 6d., and steam smalls are quiet at from 18s. to 22s.; but the actual figure largely depends on the time at which shipment is thought to be probable. Work appears to be fair in the circumstances. In the gas coal trade, the home demand is still increasing. This is a support to the collieries, though the export trade is limited by the cause above named. Best Durham gas coals are from 30s. per ton f.o.b.; for second-class gas coals, about 22s. to 23s. 6d. per ton is quoted; and for "Wear Specials," 30s. to 32s. 6d. per ton. Gas coals, however, show in a smaller measure the same irregularity that is seen in other kinds, though Durham coals are not quite as much dependent on the export as steams. Forward contracts are not much in evidence at the present time; collieries being well sold, if delivery could be freely obtained. In the freight market, the demand for steamers is very strong, and rates are firm, with that for gas coal Tyne to London based on 14s. To the French and Italian ports, there is firm quotation of "scheduled" figures. Coke is steady. Good gas coke is from 33s. 6d. to 35s. per ton f.o.b., according to the place of shipment; while the freight for coke is 41s. 6d. to the northern ports of France.

Chester Gas Company's Profit-Sharing Scheme.—It is stated in the report for the year ended June 30 of the Committee of the Chester United Gas Company's Profit-Sharing Scheme, that the bonus declared is at the rate of 5 per cent.; the price of gas having remained during the year at 2s. 11d. per 1000 cubic feet. The aggregate bonus is £420, in which 88 employees have participated, including members of the scheme who are serving with the forces.

Public Lighting of Bradford.—After a small storm of criticism of the almost entire absence of street lighting in Bradford, following a series of alarming accidents (several fatal) which have been directly attributed to the unlighted streets, the Corporation have adopted modified lighting, and about one-fifth of the 13,000 public lamps are now being lighted—the top parts painted dead-black, and the remainder a lighter brown, through which some kind of light filters. This light is to be further reduced, however, by the substitution of flat-flame burners for the incandescent burners normally used. The granting of any light at all has been appreciated by the public, though the effect is little more than that of a Chinese lantern display.

Birmingham Wages Arbitration.—Reference has already been made to the application of the Birmingham Corporation employees for an advance of wages, which it was ultimately agreed should be submitted to arbitration. The matter came last Friday before Sir George Askwith (as Chief of the Industrial Department of the Board of Trade); the proceedings being private. The claim of the men was for an advance of 1s. per day; but the Labour Committee of the Council, in view of the rise granted last year, and the war bonus conceded a few months ago, which it was arranged should be a final general settlement of wages during the war, did not themselves feel justified in breaking the agreement already come to.

Ilkeston Corporation Employees' Wages.—There has been a good deal of "beating of the drum" in Nottingham and the district lately, anent the beneficent results, in the interests of labour, of the actions of local officials of the Gas-Workers' Union, who have extended their operations to the neighbouring borough of Ilkeston. Mr. A. Hayday, the Nottingham Secretary of the organization, has pinned his faith to an allegation that the Corporation treated their employees, of whom a large proportion are gas workers, worse than any other public authority in the country. Returns officially collated, however, show that the allegation lacks substantial foundation; the Ilkeston Corporation paying, it is claimed, "not only as much as, but in some cases even more than, other authorities of a similar character."

Auer Incandescent Gaslight Company.—According to a column of "German News" in last week's "Ironmonger," the report of the Auer Incandescent Gaslight Company for 1915-16 shows gross sales amounting to 17,381,665 m. (against 9,302,973 m. in 1914-15). The net profit, including the amount brought forward, is 12,335,318 m. (compared with 5,397,594 m. for 1914-15), and the dividend 25 per cent. (as last year), leaving 2,367,008 m. to be brought forward. A sum of 5,800,000 m. is set aside as a special fund for the purchase and amortization of 6000 preference shares, of which over 1000 have already been offered by holders at the rate of 105 per cent. The report states that the Osram lamp business is prospering both at home and in neutral countries. The new chemical laboratories built for army requirements have been of great advantage to the military authorities, and 1,000,000 m. has been reserved for setting-up new machinery as soon as circumstances permit. The debts due to the Company in enemy countries are written off, as it is thought that their recovery is doubtful.

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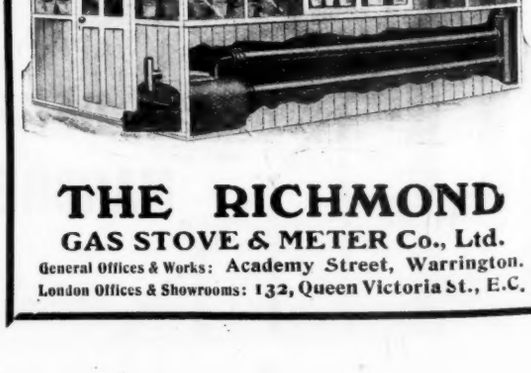

THE RICHMOND GAS STOVE & METER Co., Ltd.

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The Mannesmann Company and Newport.—The Parliamentary Committee of the Newport (Mon.) Corporation have had from the Town Clerk a report to the effect that the shares of the Mannesmann Tube Company have now been acquired by British interests, that the Company have made arrangements to go on with the Newport undertaking, and that it is intended to at once proceed with the construction of the works, the first section of which it is hoped to complete by next Midsummer. This, it was added, would entitle the Company to ask the Corporation for 500,000 gallons of water per day according to the agreement.

The Harrow Calorific Power Order.—At the last meeting of the Hendon Rural Council it was reported that a conference had been held of representatives of local authorities, with reference to the Harrow and Stanmore Gas Company's application for an Order under the Gas (Standard of Calorific Power) Act, 1916. The conference, after fully discussing the matter, came to the unanimous conclusion that objections on the following lines should be sent to the Board of Trade: (1) That the notice of the application received by the local authorities is unintelligible and confused, inasmuch as it does not state: (*a*) The consumption of gas upon which the proposed calorific standard is based, or (*b*) whether the proposed calorific standard is the gross or net measurement; (2) that power should be given to the local authorities to carry out their calorific tests at the gas-works at short notice to the Company; (3) that as the change is detrimental to the users of flat-flame burners, the Company should undertake at their own expense to replace such burners by fittings for incandescent light; (4) that the present price of gas is too high in comparison with the calorific power offered; and, in view of the excellent financial position of the Company, the price should be reduced. The report was adopted.

Derby and its Public Analyst.—Although he had held the office for many years, strong opposition was raised at the meeting of the Derby Corporation last Thursday to the re-appointment of Mr. Otto Hehner, of London, as Borough Analyst. Mr. J. F. Bell, while not wishing to be unfair, urged that "Herr" Otto Hehner had developed a very extensive practice at the expense of Britishers, and that they should put their foot down and say they had done with the Germans. Alderman Dr. Laurie appealed to the Corporation, for the sake of their own dignity and credit, not to take the appointment away from one who had the confidence of Government Departments. He repudiated the "cheap sneer" that Mr. Hehner's sympathies were bound up with Germany. He came to England in 1873, was naturalized in 1891, and had held official positions in the Society of Public Analysts and the Institute of Chemistry. He had placed his services and laboratory at the disposal of the Royal Arsenal, for which he had received the thanks of the War Office; his son volunteered for the front, but was recalled because his technical knowledge would be more useful in England; and his daughter was acting as nurse in a military hospital. By 30 votes to 10, however, the Council negatived the proposal to re-appoint Mr. Hehner; the recommendation of a successor being left to the Special Purposes Committee.

Oriental Gas Company.—At the ordinary meeting of the proprietors on Wednesday of next week, the accounts for the financial year to June 30 will be submitted, and a dividend recommended of 4½ per cent. As the interim dividend paid was 3½ per cent., the yearly rate is 8 per cent., less income-tax. The report to be submitted by the Directors states that, despite the manifold disadvantages which attend the prosecution of commercial affairs in time of war, the progress of the Company's business during the period under review was well maintained, and the result of the year's working was fully commensurate with the utmost expectations of the Directors at its inception. The gas-rental was very slightly below that of the previous financial year, 1914-15 (which was not wholly a war-period, as the year 1915-16 has been); and the sale of a diminished quantity of residual products yielded a profit not proportionately reduced. On the other hand, improved carbonization and various economies in working effected some considerable saving of expenditure. In result, the balance of revenue account carried to the credit of profit and loss was £25,203, or £891 above the corresponding figures of last year. Operations in the nature of extensions and additions properly assignable to capital had been limited, having regard to the cost of materials and other conditions in operation during hostilities. The amount thus expended was defrayed out of the revenue of the year, withoutrecourse being had to the reserve fund. The rate of exchange was favourable—a fraction above 1s. 4d. to the rupee.

Lancaster and its Gas Supply.—At the statutory meeting of the Lancaster Town Council last Thursday (after the re-election of Mr. W. Briggs as Mayor), Sir N. W. Helme, M.P., obtained permission to draw attention to the further development of the gas undertaking as the outcome of negotiations with the Government departments for an increased supply of gas to their new works. A few weeks ago, he said, they had a request that astonished them. They were asked to arrange for an additional supply of gas for Government purposes amounting to 26 million cubic feet a year. For this production an expenditure of £18,000 was sanctioned; and by the installation of the water-gas plant they were able quickly to respond to the demand. Since then they had had an intimation from the new Government works that they could use no less than 90 millions a year. They had had a report upon the matter, and he had discussed it with the authorities in London, who had agreed to give it consideration, and an Inspector had visited the town the previous day. The result was that, as a matter of emergency, he proposed that the Gas Committee be empowered to carry out the request of the Government department and lay a new main for the supply of gas to the new works, at an estimated cost of £3000—the question of payment to be arranged between the Gas Committee and the Government department. If the Committee were required to provide the funds, he thought they would ask for a guarantee as to the consumption. They had strained the producing power of the works as augmented by recent expenditure in order to meet the immediate demand of the Government; and in face of an increasing winter load they must have some guarantee. The Government departments had been taking gas at the rate of 81 million cubic feet per annum. This would, of course, raise the question of augmenting the supply of coal and oil. The proposal, after some discussion, was agreed to.

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Decreased Sales at Smethwick.—At the annual meeting of the Smethwick Town Council, last Thursday, the Gas Committee reported that the quantity of gas sold during the half year ended Sept. 30 was 222,818,500 cubic feet, a decrease of 213,400 cubic feet when compared with the corresponding period of last year.

Wexford Gas Lighting.—At a meeing of the Wexford Corporation, a letter was received from the Gas Company intimating an increase in the price of public lighting from £4 1s. 10d. to £4 14s. 10d. per lamp. The Clerk stated that there had been an increase of 50 per cent. since the beginning of the war. For the year ended in June, 1915, the cost of lighting was £518 odd; for the year ended June, 1916, £412 9s. 7d.; and for the year ending in June next, with 102 lamps—a reduction of 72 in the number—the amount would be £483 13s. 7d.

An Agreement as to Public Lamp Charges.—Upon the recommendation of the Finance Committee, and at the request of the two Gas Companies concerned, the Alfreton Urban District Council have agreed to pay the Riddings and Alfreton Gas Companies 5 per cent. upon the capital value (placed at £3 per lamp) of the street-lamps, as compensation to the Companies, seeing that no gas is being used in the streets. The amount to be paid to the Riddings Company is £49, and to the Alfreton Company £22.

Emergency Extinguishing at Oxford.—The Chief Constable at Oxford reported to the City Council at their last meeting that, with regard to air-raids, there had been a difficulty with the gas-lamps which did not apply to the electric lights, inasmuch as the former were lighted by clockwork instruments, and could not be put out quickly. The newly-appointed Manager (Mr. W. E. Caton) had, however, got over this trouble; and the Company were going to have chains hung sufficiently low down to be reached with a stick, so that the gas-lamps could be more easily extinguished.

Exemption Applications at West Bromwich.—Last Wednesday afternoon, at the West Bromwich Military Tribunal, Mr. W. H. Johns (the Gas Engineer) applied for the renewed exemption of three stokers, an engine-fitter, two gas-fitters, and a carter; three being single men. He explained that they were prepared to let any of the men go if they could find substitutes; but at present they were experiencing great difficulties at the gas-works owing to the shortage of labour. The Chairman of the Gas Committee (Alderman Brockhouse), supported these remarks, and said they now had 48 men less in the department than during the summer of 1914; whereas they really needed about 20 more. The Tribunal granted exemption for three months; but with the three single men only until the military found substitutes.

STOCK MARKET REPORT.

BUSINESS on the Stock Exchange last week was not very exhilarating, and there was a good bit of fluctuation from time to time, both in the volume of business done and in the general tone of markets. But this was at any rate better than that they should be uniformly dull throughout; and, moreover, the apparent tendency at the close was not by any means the worst of the week.

Perhaps the most absorbing point of interest was the new War Loan that is to be, which was the subject of constant discussion as to its when and how and how much, and all the multiplicity of detail—the upshot of it all being, as usual, a case of *quot homines, tot sententiæ*. But there was more approach to agreement when our Government methods were contrasted with the French, much to the disadvantage of the former.

In Home issues, the War Loan was quieter and lacked support, closing rather easier than at the start; but Consols were fairly steady. In Home Rails there was a small demand for the best secured issues but the ordinaries had a very dull time. The American Market was interfered with by the Presidential Election, of which it appears to be so difficult to ascertain the result; and the tendency was weaker. Argentine Rails continued dull, but the South African market was fairly steady.

The Foreign Market was easier on the whole. Both French loans were rather lower in reaction from their previous sharp advance, and Japanese were dull. But Chilian and Peruvian were in favour. Among the Miscellaneous group, Rubbers and Oils were fairly firm, and textiles, meat concerns, and warlike industries were in demand.

Business in the Gas Market continued very restricted in point of volume; the aggregate of bargains marked being about a tie with the paucity the previous week. In regard to prices, one or two issues indicated a disposition to move upward, and one or two others pointed in the opposite direction; but the prevalent tendency on the whole was steady. It appears that the Buenos Ayres Municipality have at last agreed to a settlement with the Primitiva Company. In the "JOURNAL" of Aug. 15, it was mentioned that the President of the Argentine Republic had drawn the attention of Congress to the matter, and had expressed regret at the long delay. In the Money Market, the general position was easy.

Bargains done for cash during the week were as follows: On Monday, Bombay 5¼, Gas Light ordinary 75, 75⅛, 75⅛, ditto preference 69½, 69⅝, 69¾, 69⅝, 70, ditto debenture 59¼, Primitiva 40s. On Tuesday, Commercial 4 per cent. 73¾, Gas Light debenture 60, Primitiva preference 65s., South Metropolitan 84¼, South Suburban 81, 81⅛, 81⅛, 81⅜, Tottenham "B" 90½, 90¾. On Wednesday, Bombay 5 1/16, 5⅛, Continental Union preference 56, Gas Light preference 69½, 70, Primitiva debenture 81½. On Thursday, Gas Light ordinary 74, Liverpool debenture 75, Primitiva 40s., ditto preference 60s., 63s. 9d., 65s., South Metropolitan 84¼, 84⅜, 84⅛, 84⅜, 85, South Suburban debenture 90½, 91. On Friday, Continental Union 38, Gas Light ordinary 74, 74½. Imperial Continental 83. On Saturday, Continental Union preference 56⅛, 57½, Imperial Continental 80, 81, Oriental 108¾, 109¼.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	"	April 8	2½	5%	Alliance & Dublin Ord.	59—64	62—64	..
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅛—5⅜	4⅞—5*	5 1/16—5⅛
50,000	10	Feb. 26	16	16/-	Bournemouth Gas and Water Co. 10 p.c.	29—30	26—27	..
338,110	10	"	7	7/-	Bournemouth Gas and Water Co. B 7 p.c.	15—15½	11—11½	..
115,000	10	"	6	6/-	Bournemouth Gas and Water Co. Pref. 6 p.c.	13¾—14	9¾—10	..
159,740	—	—	—	4%	Do. 4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consold.	261—266	86—88	..
784,920	"	"	†11	53/9	Do. B New	204—209	83—85	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—98	69—71	..
217,380	Stk.	Feb. 26	11	10⅝%	Brighton & Hove Orig.	208—213	165—168	..
244,200	"	"	8	7¾%	Do. A Ord. Stk.	154—159	121—124	..
630,000	20	Mar. 26	12½	22/6	British	44—45	34—35	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
245,771	Stk.	June 26	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1¼—1⅜	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4⅜—5½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	85—86	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	73⅜
560,000	"	"	5½	46/8	Do. 3½ p.c. do.	103—105	68—70	..
475,000	"	June 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	..
800 000	Stk.	"	4	—	Continental Union, Ltd.	76—79	36—38	..
200 000	"	"	7	—	Do. 7 p.c. Pref.	115—118	56—58	56—57½
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	175—185	..
—	—	—	—	10%	Do. E	..	..	..
499,270	Stk.	—	6	5⅞%	Derby Con. Stk.	128—128	100—105	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,009,180	10	July 29	10	7/6	European, Ltd.	17½—18	12½—13½	..
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke 4 p.c. Ord.	98—102	74—76	74—75½
2,600,000	"	"	3½	3½%	Gas Light and Coke 3½ p.c. max.	76—79	55—58	..
4,062,235	"	"	4	4%	Gas Light and Coke 4 p.c. Con. Pref.	96—99	6 —71	69½—70
4,674,850	"	June 11	8	8%	Gas Light and Coke 8 p.c. Con. Deb.	72½—74½	59—61	59½ 60
130,000	"	"	10	10%	Gas Light and Coke 10 p.c. Bonds	..	..	..
258,740	Stk.	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	8—9	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	125—135	..
191,000	Stk.	Mar. 12	7½	7½%	Ilford A and C	151—154	112—117	..
65,780	"	"	6⅜	6⅜%	Do. B	115—118	103—108	..
65,500	"	June 26	4	4%	Do. 4 p.c. Deb.	99—94	73—76	..
4,940,000	Stk.	May 14	9	4½%	Imperial Continental	150—160	80 85	80—81
1,335,000	Stk.	Feb. 12	8½	8½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,342	Stk.	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,905	Stk.	Feb. 26	10	5%	Liverpool 5 p.c. Ord. {A / B	211—213 / 146—148	87—88	..
806,083	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	75—77	75
75,000	5	June 11	6	2/-	Malta & Mediterranean Met. of Melbourne 4½ p.c. Deb.	4¼—4⅝	4—4½	..
250,000	100	April 1	4½	4½%		99—101	89—93	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8⅞—9½	..
1,875,892	Stk.	July 29	4½	4½%	Newc'tle&G'tesh'd Con.	98½—99½	79½—81½	..
529,705	Stk.	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7/14/0	7/8/8	North Middlesex 7 p.c.	14—15	10½—11½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	108—110	108¾—109½
60,000	5	Mar. 26	10	1-	Ottoman, Ltd.	7½—7⅞	2—3	..
60,000	50	Feb. 26	13	12½	Portsea, Island B	128—131	95—100	..
100,000	50	"	12	11½	Do. C	118—121	88—93	..
52,000	50	"	10	9½	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	2 2¼	40/-
499,960	5	June 26	5	2/6	" 5 p.c. Pref.	4¾—5	3 3⅜	60/—65/-
521,600	100	June 2	4	4%	" 4 p.c. Deb.	91—93	80—82	81½
—	—	—	—	4%	" " " 1911	..	..	..
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	63—68	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	8—8½	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47—49	43—45	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	188—1 2	..
209,984	"	"	10	10%	Do. B	222—224	188—192	..
623,500	"	"	10	10%	Do. C	220—222	188—192	..
90,000	10	May 28	9	6/-	South African	10½—11½	..	..
6,609,895	Stk.	Feb. 10	6/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85	81½—85
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	59—61	..
224,820	Stk.	Feb. 26	8½	8%	South Shields Con. Stk.	167—169	145—147	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	81 81½
60.000	"	"	5	5%	Do. 5 p.c. Pref.	110—112	79—81	..
135,000	—	—	—	48/4	Do. West Kent.	..	..	..
187,558	"	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	90—92	90½—91
647,740	Stk.	May 14	5	5%	Southampton Ord.	99—102	90—95	..
120,000	Stk.	Feb. 12	7½	7½%	Tottenham District A 5 p.c.	135—138	120—123	..
782,275	"	"	6	5⅝%	Tottenham District B 3½ p.c.	116—117	90—92	90½ 90⅝
181,255	"	June 26	4	4%	Tottenham District 4 p.c. Deb.	87—89	73—75	..
189,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	98—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth, 5 p.c. max.	103½—109½	91—92	..
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	117—122	..
255,636	"	"	6¾	63/9	" B 3½ p.c.	129—134	101—103	..
108,075	"	"	5/17/8	55/1½	" C 3½ p.c.	110—115	88—93	..
852,000	"	"	6½	57/6	Wimbledon 5 p.c.	117—122	93—95	..
98,000	"	"	6⅝	63/9	Epsom 5 p.c.	121—126	98—103	..
88,416	"	June 26	8	8%	3 p.c. Deb. Stk.	66—69	53—56	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

Mayoral Statement at Halifax.—The Mayor's statement of the past year's working of the Halifax Gas Department, showed that the sale of gas decreased by 36 million cubic feet in comparison with the previous year, which was a small decrease taking into consideration the restriction of public lighting. There was a continuance of profitable return on the residual products. This branch was being well developed at Halifax; and in view of the enormous increase in the price of coal—£56,000, as compared with £32,000 four years ago—the recovery and sale of secondary products became more then ever important, so as to prevent the full weight of the increased cost of coal falling on the users of gas.

Omagh Gas-Works.—On the Omagh (co. Tyrone) Urban Council agreeing to a war allowance of 1s. 6d. per week to the stokers in the gas-works, the Chairman (Mr. T. Johnston, J.P.) said the financial position of the undertaking was serious, and would be more so at the end of the year. As far as the ratepayers were concerned, it would be better if the works were closed-down for the present. He was afraid they would not be able to meet the interest and the instalment which would fall due shortly. Mr. Hutchinson suggested an increase in the price of gas; but the Chairman said this would require an Act of Parliament. Mr. Lynch remarked that the street lighting should be further restricted, and private consumers should be asked to be as economical as possible.

Guiseley Water-Works Purchase.—At the annual meeting of the Guiseley Water Company last week, at which a dividend of 6 per cent., free of income-tax, was declared, it was announced that an agreement has been reached under which, subject to the approval of the Local Government Board, the undertaking of the Company will, on the conclusion of the war, be sold to the Guiseley District Council for £16,000 —at the rate of £2 per £1 of the share capital. There is some little criticism of the agreement locally, on the ground that a few years ago the undertaking could have been purchased at one-fourth less than the present figure, and that negotiations then ought to have ended in purchase. But the figures of the Company, who have done well in recent years, indicate that even now the agreement is not a bad bargain.

Leeds Gas-Works and Female Labour.—The Leeds Corporation last Thursday approved a minute of the Gas Committee empowering Mr. W. B. Leech (the Engineer and General Manager) to employ female labour as and when required. It is not expected that there will be an immediate invasion of the retort stoking and similar heavy manual jobs of the works by women, though some laborious work has already been done by them at Leeds. During last winter, a score or so women were employed in coal heaving; but they were dispensed with in the summer, when their services were not required. There are at present no women on manual labour in the Leeds works, though there are a considerable number of them as clerks, meter inspectors, &c. With the increasing shortage of men, it is anticipated that very soon women will be looking after the maintenance of gas-fires, and work of this kind; and Mr. Leech says that it may yet come to women having to definitely substitute men in taking coal out of stock.

Macclesfield's Consumption Reduced by the Summer Time Act.—According to a report presented by the Engineer (Mr. J. E. Blundell) to the Macclesfield Gas Committee at their last meeting, a reduction of consumption of over 7 million cubic feet of gas is shown during the period the Daylight Saving Act was in force. The figures are: 1915, 59,947,000 cubic feet; and 1916, 52,921,000 feet, equivalent to a reduction of 11·7 per cent., representing a saving of about 500 tons of coal.

The Darlington Water Committee report a net profit for the past year of £7706, and recommend that £6000 be transferred in aid of the rates, and the balance of £1706 be carried forward.

The men in the gas, water, and highways departments of the Birstall District Council having applied for an increase of wages, the Council have granted a war bonus of 2s. per week, which it is estimated will cost £150 per annum.

A fire, believed to have been caused by the fusing of an electric wire, broke out one day last week in the premises of the Dunfermline Co-Operative Society. Part of the building was gutted; the damage done being estimated at not less than £1000.

The first appearance of the new Mayoress (Mrs. Bassett) in Burton-upon-Trent was at the gas show-rooms, where she presented the prizes to the winners in a very successful and popular home bread baking competition, which has just been held. Mr. R. S. Ramsden (the Gas Manager) states they got the idea of the competition from the British Commercial Gas Association "Bulletin," and were helped in several details by Mr. F. Livesey, of the Maidstone Gas Company.

At the last meeting of the Lynton District Council, the Surveyor reported that the supply of water in a newly sunk well was very good. It was 33 feet deep, and contained 5700 gallons. Mr. Stanbury remarked that he had never had any confidence in diviners; but there seemed to be something in their practice he did not understand. No one who looked over the field would imagine there was any water there; while not far away they had the railway cutting across the rock at a greater depth than the well, and without any sign of water.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

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Appointments, &c., Vacant.

CHARGE OF SUCTION GAS, &c., PLANT, &c. Oxford Cold Storage and Ice Company.
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Plant, &c. (Second-Hand) For Sale.

EXHAUSTER ENGINES. Bath Gaslight Company.
PIPES, &c. No. 6235.
PIPES AND CONNECTIONS. Blackburn Gas Department.

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GASHOLDERS. No. 6239.

Wanted to Purchase.

CARBON. No. 6192.

TENDERS FOR

Coal.

NOTTINGHAM WORKS AND WAYS COMMITTEE. Tenders by Nov. 30.

General Stores and Materials.

NOTTINGHAM WORKS AND WAYS COMMITTEE. Tenders by Nov. 20.

BOOKS AND LEAFLETS

TO BE OBTAINED FROM

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COAL TAR AND AMMONIA.—By GEORGE LUNGE, Ph.D. Fifth Edition Three Vols. *Price* £3 3s.

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CALORIMETRY OF PRODUCER AND ILLUMINATING GASES.—By JOHN F. SIMMANCE, Assoc. M.Inst.C.E., M.Inst.Mech.E. *Price* 2s.

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LAW RELATING TO GAS AND WATER (Michael and Will).—Sixth Edition. By SCHOLEFIELD. *Price* 42s.

MOND GAS SCHEME.—By F. N. KEEN, of the Middle Temple, Barrister-at-Law. *Price* 1s.

MODERN METHODS OF SAVING LABOUR IN GAS-WORKS.—By C. E. BRACKENBURY. *Price* 3s. 6d.

GAS, OIL, AND AIR ENGINES. — By (the late BRYAN DONKIN. Fifth edition. *Price* 25s.

COMPETITION POINTS FOR GAS SALESMEN.—By ARTHUR F. BEZANT. *Price* 3s. 6d. *net.*

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